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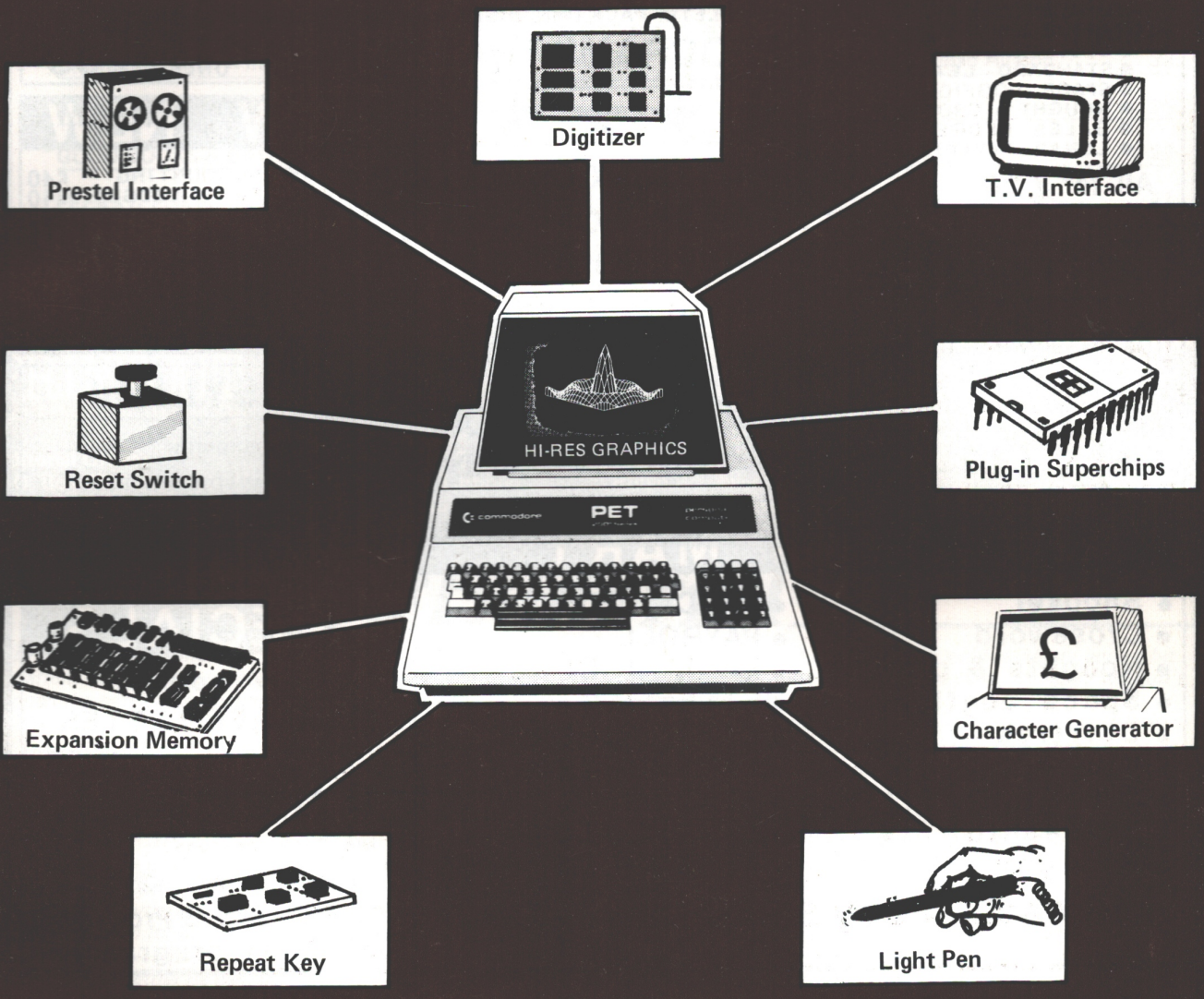


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# Editorial

*Join with me for a moment in visualising a fairly familiar situation; one you've probably been in at some time or other, though the part you played may have varied. It's the time when you're with a friend who's heard you've recently acquired, let's say, DataMaster - a widely-advertised, highly-praised, extremely well-written data-base program (though let me quickly say now that, so far as I know, there is no software product called DataMaster, and I apologise to whoever produces it, if there is!).*

*"I hear you've got this new data-base program everyone's raving about. What's it like? Any good?" he asks, and, because it* **is** *very good, you enthuse. In fact, you do more than enthuse; you extol its virtues, ingenuity and smart programming at considerable length. Your friend is impressed. So impressed that he asks whether he can drop a blank disk in next day on his way to work, so that you can run him a duplicate when you've got a minute.*

*What do you say at that stage? Do you respond by agreeing, because he's a friend, and it's nice to share your enthusiasm, and to have someone share it with you, and because he's given you programs in the past, and because you can't imagine what his face would be like if you said "no". Or do you say "Look, I'm really very sorry, and I hope you won't misunderstand, but I reckon that it took some programmer about two or three hundred man-hours to develop DataMaster, and you won't buy one if I give you a copy, which means the guy who programmed the thing is being done out of some of his pay for the work he put in."*

*Would those readers who* **would** *react in the latter way please turn the page now, because I'm about to bet the rest a pound that their reaction is almost certainly the former. Let's face it: not many of us would even think of saying "no", let alone have the guts to see our refusal through; debate the moral issues; appear self-righteous; risk losing a friend; and have him spread the word that we'd suddenly gone a bit weird over something that* **everyone** *does. We really wouldn't take that risk, would we?*

*But now let's turn it round. Hacking away one day, we suddenly stumble across a programming twist that, the more we think about it, the more potential it seems to have. It's new, original, and opens up enormous vistas for speedily achieving what's either been painfully slow before, or downright impossible. In the days that follow, a total concept takes shape in our mind, and we* **know** *we're on a winner. Hundreds of hours later, we've developed it to an ultimate stage of perfection, and we have a program that takes the art to a far boundary. We spend a dozen or so more hours on final polish, and then send it on a disk to a prominent and world-famous software publishing company.*

*Their response arrives in days: "terrific potential" and "many hundreds, if not thousands, of sales expected" are just two of the phrases in their letter offering to market the program at very good royalty rates. Happily, we accept - and it takes a year or more for disillusion to set in.*

*Our program's being marketed in a dozen or more countries. The reviewers have fallen over themselves to tell the world how good it is. There's talk of an award for the year's best contribution to the art. The software publishers have done a fine job of packaging and marketing. And almost everyone we know seems to be using it. But our sales linger around the 200 mark, with the publishers' figures demonstrably accurate at that level.*

*What went wrong? Why, for those hundreds of hours and genuine innovation, have we only been effectively paid less than a Bob-A-Job Boy Scout?*

*Have a guess. Then write and tell us what you think.*

*TERRY HOPE*

# The PIC-CHIP.... a powerful easy-to-use graphics facility for all New Rom PETs.

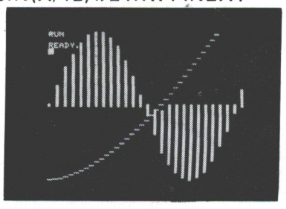
**The PicChip is** a ROM module which simply plugs into your PET making available immediately over forty new BASIC commands. These commands use BASIC variables as parameters (no PEEKing or POKEing) and enable the graphic possibilities of the PET to be fully exploited - even by beginners! Using an X, Y coordinate system based on an origin specified by program, lines, graphs and drawings of all kinds can be generated on the screen by simple programming. Other commands enable defined areas, or the whole of the screen, to be rolled or shifted up, down, left and right. Images can be stored to and retrieved from any RAM address.

Originally designed for **scientific** and **technical** applications, the PicChip is also being used in **educational projects, games** and **design work** of all kinds. The combination of fast plotting and area manipulation makes the PicChip ideal for the continuous display of real-time data in graphical form.

Just see how easy it is to use PicChip commands: the following examples were all photographed directly from a PET screen.

Picture 1 shows two curves, one drawn in fine-density and one in bar form, produced by two program lines:

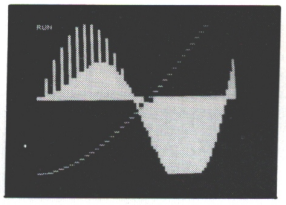
```
10 FOR X=0 TO 39:Y = X↑1.5:!WF:
NEXT
20 Y0=25:FOR X=0TO79 STEP 3:
Y=SIN(X/12)✱24:!WY:NEXT
```




(1)

Picture 2 adds a third program line to plot a function as adjacent bars:

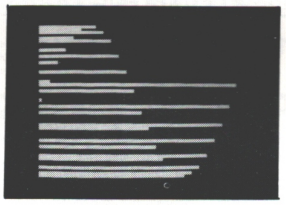
```
30 FOR X = 0 TO 79:Y=SIN(X/12)✱
X/2:!WY:NEXT
```




(2)

If we just take the second program line and change !WY to !WX, the bars are plotted horizontally:

```
20 FOR X = 0 TO 79:Y=SIN(X/12)✱24:
!WX:NEXT
```

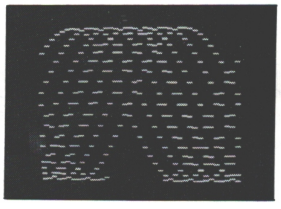


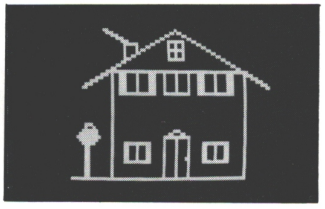
(3)

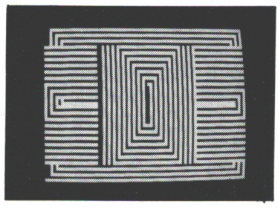
All the other pictures reproduced here were generated by the DEMONSTRATION PROGRAM included in the 20-page Handbook. What we can't show here are the amazing effects produced by shifting or rolling or otherwise manipulating different areas of the screen. There is even a repeat-key function, and commands for reading and setting the cursor position in X,Y co-ordinates.

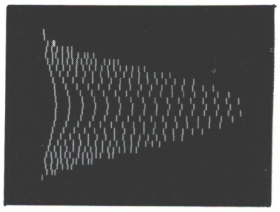
**PicChip Functions.**

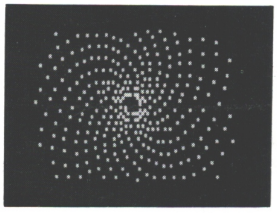
| Command | Function |
|---|---|
| SYS 45056 | PicChip On |
| !RE | Restore screen |
| !CO | PicChip off |
| !RP | Repeat-Key on |
| !RO | Repeat-Key off |
| !CW | Cursor-position Write |
| !CR | Cursor-position Read |
| !AF | Area Fill |
| !AR | Area Reverse |
| !AN | Area Normal |
| !AI | Area Invert |
| !AS | Area in Shift case |
| !AU | Area in Unshift case |
| !AC | Area Case invert |
| !AF | Screen Fill |
| !SR | Screen Reverse |
| !SN | Screen Normal |
| !SI | Screen Invert |
| !SS | Screen in Shift case |
| !SU | Screen in Unshift case |
| !SC | Screen Case invert |
| !US | Up Shift |
| !DS | Down Shift |
| !LS | Left Shift |
| !RS | Right Shift |
| !UR | Up Roll |
| !DR | Down Roll |
| !LR | Left Roll |
| !RR | Right Roll |
| !WP | Write Point |
| !EP | Erase Point |
| !WL | Write Line |
| !EL | Erase Line |
| !WC | Write Continuous line |
| !EC | Erase Continuous line |
| !WX | Write bar in X axis |
| !EX | Erase bar in X axis |
| !WY | Write bar in Y axis |
| !EY | Erase bar in Y axis |
| !WF | Write fine Y |
| !EF | Erase fine Y |
| !FW | Write fine X |
| !FE | Erase fine X |
| !CS | Copy Screen |
| !PC | Poke Character |











The standard PicChip plugs into socket UD4 of the PET, but is also available to fit either of the other two sockets. PicChip is therefore **compatible with other PET ROM packages.** Installation and use are fully described in the handbook.

The PicChip costs just £50 + VAT. To buy the handbook separately costs £5 but this may be offset against an eventual purchase of the chip. State required socket when ordering. **10% discount to educational institutions.**

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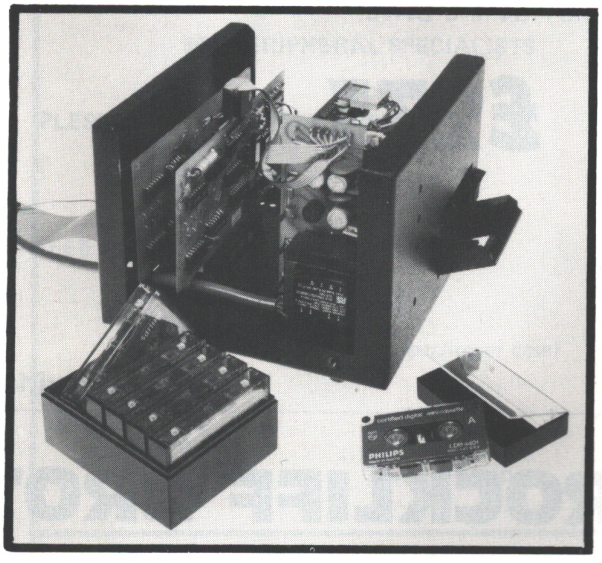


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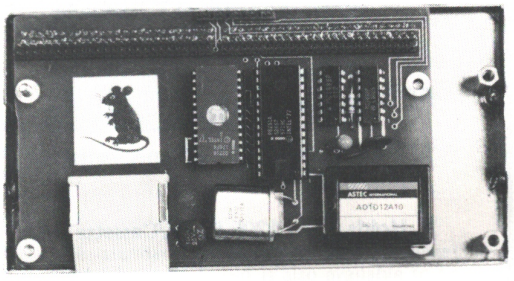

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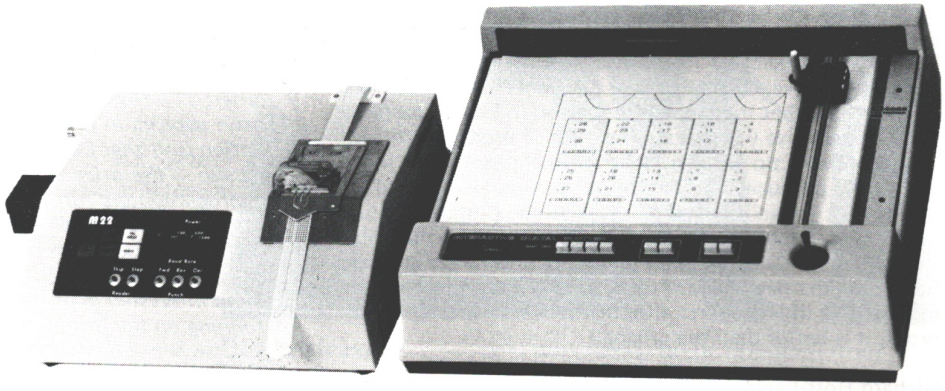

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# READ/WRITE ... the pages where you have YOUR say!

### X & Y or is it Y & X?

Your October issue was pretty good, keep it up! I liked the 'Cursor Positioning' statements; simple and brilliant, wish I had thought of it a year ago. By the way, you printed it wrongly: **Y** is the row and **X** is the column.

On the subject of lower-case printing, Small Systems Engineering have a little box that can convert the characters on the fly, so that they match the screen in lower-case mode. A trifle expensive yet, but it saves a lot of processing time. I liked Tommy's tip for generating data statements so much that I have produced an "improved" version - listing and tape enclosed. It has an increment as well as line number for the first data statement, and the whole routine can be renumbered and still works (see line 40). PEEK/POKE numbers are specifically for the new ROM. Precautions are built in to catch most of the likely errors: although it is not entirely foolproof, it is better than the original!

Richard Ross-Langley,
Technical Director
Mine of Information Ltd.,
1 Francis Avenue,
St. Albans

```
 0 REM POKE NUMBERS SET FOR NEW ROM
 5 PRINT"[CLR RVS]MOI DATA STATEMENT GENERATOR[OFF DN]"
 10 PRINT"NO RESTRICTION ON NUMBERS, COMMAS ETC.[DN]"
 15 PRINT"PUT UPPER/LOWER CASE TEXT IN QUOTES.[DN]"
 20 PRINT"BE CAREFUL WHEN USING CURSOR MOVEMENTS.[DN]"
 25 INPUT"[RVS]DATA LINE NUMBER, INCREMENT[OFF] ";A,I
 30 A=INT(A):IF A<1000 THEN 25
 35 I=INT(I):IF I<1 THEN 25
 40 N=PEEK(55)*256+PEEK(54)
 45 F$="":PRINT"[CLR]*[LEFT]";
 50 GET A$:IF A$="" THEN 50
 55 IF A$=CHR$(13) THEN 75
 60 F$=F$+A$:PRINT A$;
 65 IF POS(0)=0 THEN 45
 70 IF POS(0)+PEEK(196)<68 THEN 50
 75 IF F$="" THEN 95
 80 PRINT"[CLR]";A;"[LEFT]DATA ";F$:
 85 PRINT"I=";I;":A=";A;"+";I;":GOTO";N
 90 POKE 158,3:POKE 623,19:POKE 624,13:POKE 625,13:PRINT"[HOME DN DN]":END
 95 REM PROGRAM PROPER STARTS HERE
 63000 DATA THIS HAS BEEN ENTERED USING THE PROGRAM TO GENERATE MAX LENGTH LINE.
READY.
```

*Tommy salutes you, Richard. The program that can't be improved has yet to be written, he says. For an example of this technique in action, take a look at Julian Allason's Mailing List program a few pages on.*

### DESPERATE DAN

Thank you very much for the free plugs in your September and August issues. I should perhaps be offering you a small commission, as we picked up another client as a direct result of your editorial. One more source of infuriatingly incomplete information soon to be coming your way!

I have never, and will never, include prices in new product press releases, for several obvious reasons (which I would have thought you would have twigged).

1. There is often a considerable delay between the release being issued and publication. With inflation being what it is, you would be giving your readers out of date prices.
2. Most distributors and manufacturers have a trade price list, an OEM/large user price list, as well as an end-user price list or recommended retail price list. Which would you want? All of them?
3. In the case of flexible disks, there may be fifty different types. Do you want them all?
4. Most publications do not (as an Editorial Policy) print prices, so the whole exercise would be rather futile.
5. Generally, clients want to make contact with prospective buyers. Oddly enough, they get more interest if prices are not printed.

Having said all this, I am prepared to make an exception and to let you have end-user price details - but only if you promise to keep publishing my name in forthcoming issues!

Best regards,
Dan Bogard & Associates,
40 Kingsley Avenue,
Ealing, London W.13.

*It is possible to miss the point once – but five times? Perhaps Dan has his tongue in his cheek. So dealing with his points in order: [1] Hotline is the last section to go to press, so the news appears in print less than a month after it breaks. Inflation isn't that bad. [2] Only one price is required in a press release – the price the customer pays. [3] The majority of microcomputers run with soft sectored 5¼" single density, single sided diskettes - what about a price for these? [4] PRINTOUT, in common with ALL the microcomputer magazines, prints prices. [5] Perhaps readers can tell us if they are more interested in priced or unpriced products. Our money is running on the former.*

### RETURN OF THE INVADERS

The 'bug' in CBM's Space Invaders is caused by leaving the demonstration part of the program running. Provided that the 'demo' part isn't used, the program runs perfectly. All you need do, after having finished a game, is press a key to make the program say 'PUSH ANY KEY TO START', and then leave it until you are ready to play. In my spare time, I tried to fish out this bug, by disassembling the program onto the printer (which took an hour and a half!) But since the program is [a] hand assembled and thus great gaps were present, and [b] incredibly complicated, using interrupt counters to run the demo with four different interrupt entries, I haven't fixed the bug. But at least I've got a good idea how it works. Readers may like to know of some enhancements that can be made to the program.

At location $0E01 are stored the speeds at which the player can move his/her base and fire. The value is normally set to 2. By changing it to a 1 with either the machine code monitor (new ROM machines), or a POKE, you can double your speed. $0E09 is the location controlling the firing speed of the space invaders, and usually contains a 4. Location $0E0E controls the speed of the larger mystery craft that appears from time to time. It is usually set to 6. One more fun location is $0623. This contains the character fired behind the missile, normally a 'space', to erase the old missile as it moves up the screen. If this character is changed, you have a new game called WALL INVADERS. Try $66. When you fire a wall is created through which you may fire, but they cannot!

Paul Higginbottom,
Sussex Place
Slough

*Thanks for the suggestions, Paul. Readers may like to know that Paul is one of the leading lights of Commodore's software department. So now we know what they do all day! Our thanks also to everyone else who wrote in about Space Invaders. The correspondence is now closed, however. Unless, of course, you have discovered something really amazing.....*

### RED FACES

You should be ashamed of the job you did in PRINTOUT No.9 of reproducing the table accompanying my article, "What's Wrong with Wordpro?" The following errors "crept in" between my copy and the printed page:

C/S: "Sets one *tape*...." should read "Sets one *tab* "
C/C: "status line)" should be on line above.

*Continued on page 10*

# "If you want what's best for your PET, choose Commodore software."

Kit Spencer
General Manager
of Commodore Systems
360 Euston Road
London NW1 3BL

**The Commodore PET is Britain's best selling micro-computer, with over 10,000 already installed in a wide range of fields, including Education, Business, Science and Industry.**

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**And Commodore has met this demand by producing a first class range of programs, now available from the nation-wide network of Commodore Dealers.**

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Over 50 Petpacs of programs are available (mainly on cassette) from Commodore Dealers.

These cover such popular titles as Strathclyde Tutorial, Statistics pack 1, Assembler Development System, Stock Market Trends and the Treasure Trove Collection of game packs including the award winning Star Trek, which is packaged with Petopoly. Prices are from £5 to £50.

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PET systems are simple to use and any normal advice or assistance you may need can be obtained from Commodore Dealers.

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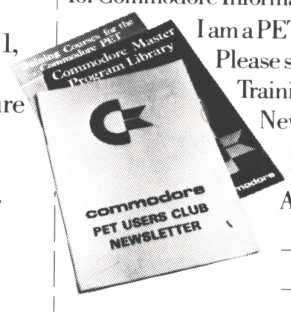
## PET USERS' NEWSLETTER

This is Commodore's official method of sharing new information and ideas between the many thousands of PET users. The newsletter is published regularly and for an annual subscription of £10 you can start receiving copies now.

Look out for this sign. It tells you that compatible products of other manufacturers have met with our standards of approval.

(Tick the appropriate boxes)




To: Commodore Information Centre, 360 Euston Road, London NW1 3BL 01-388 5702

I am a PET owner ☐ Please put me in touch with my nearest dealer ☐

Please send me details of: Commodore PET Software ☐ Training Courses & Seminars ☐ I would like to receive the Users' Newsletter and enclose £10 annual subscription ☐

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Address _____

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# READ/WRITE Continued.....

C/A2R/: "Appends paragraph *if*..." should read "Appends paragraph *of*..."
Insert/Delete Functions heading should read "(see also SHIFT C/ and C✱)".
HOME: ninth line should read "or with C/↑ or C/I...."
Entering Variable Data: second line of heading should read "form letters is first *stored*...."
P: "Sets line per page...." should read "Sets lines per page..."
C: eleventh line should read "reformatting *and* retyping."
Y or N: second line should read "... *try* a new...."

If that weren't enough, you left out one arrow head and six labels on Fig. 1, the Block Diagram, making the remaining two labels senseless. Did you ever consider going to work for Commodore's Instruction Book Department?

I also am not perfect, though less not perfect than you and your cohorts. I omitted the shift-left-arrow sign, which is the tab key. It is also useful to know that, when reviewing variable data letters, reverse up-arrow can be used to delete the item on which the cursor is placed, so that the item can be rewritten using the insert mode (shift reverse).

I appreciate the reason for the cuts to the text, with the exception that the deletion of reference to the Block Diagram, Fig. 1, was unfortunate, as the reader has no reason to believe that there is any backup to the text here.

It was rewarding to see a favourable reference in the READ/WRITE column to Lindsay Doyle. It would be more rewarding if I could be present when you assume a prone position prior to grovelling in the approved manner and printing an admission that the errors were not committed by L. Doyle.

Yours beadily,
Lindsay Doyle
Dublin,
Irish Republic

P.S. I see that you still haven't gotten rid of your hangups on female anatomy on the front cover. If this trend is to continue, let's have larger girls or smaller PETs!

*It's a fair cop, guv. We grovel. Job applications dispatched to Commodore, though we doubt they will have us.*

## FORMATTED ACCOUNTS

Although my "accounts format" must contain nothing new to advanced readers, I have looked in vain through most of the books on PET for guidance in this matter.

Before this problem came up I vaguely assumed that PET would "automatically" deal with formatting with a few simple instructions, but it is a little more complicated than I had supposed.

P.D. Smith,
Leasway,
Wickford
Essex

```
 80 PRINT"◔▼"
 90 PRINT"EXAMPLE OF FORMATTING MONEY AMOUNTS FOR ADDITION."
 95 PRINT
 96 REM PET PROVIDES ACCOUNTING ACCURACY UP TO TOTAL SUMS OF 999,999.99 POUNDS.
100 INPUT"FIRST AMOUNT";A
110 INPUT"SECOND AMOUNT";B
120 C=A+B:REM SUM
125 REM LINES 130-145 ADD '.00' TO      INTEGER POUND AMOUNTS
126 REM TO ENABLE E.G '186.00 ' TO BE SO PRINTED RATHER THAN '186'
130 A$=STR$(A):IFA=INT(A)THENA$=STR$(A)+".00"
140 B$=STR$(B):IFB=INT(B)THENB$=STR$(B)+".00"
145 C$=STR$(C):IFC=INT(C)THENC$=STR$(C)+".00"
147 PRINT:PRINT:
148 REM LINES 150,160,&180 ENABLE DEC.  POINTS TO BE LINED VERTICALLY,
149 REM I.E. 'RIGHT JUSTIFIED'
150 PRINTTAB(20-LEN(A$))A$
160 PRINTTAB(20-LEN(B$))B$
165 REM 170 & 190 ENABLE THE LENGTH OF  PRINTED LINES TO BE ADJUSTED
166 REM TO SUIT THE NO. OF DIGITS OF    THE ENCLOSED NUMBER.
170 FORJ=1TO(LEN(C$)-1):PRINTTAB(20+1-LEN(C$))"-";:NEXT:PRINT
180 PRINTTAB(20-LEN(C$))C$
190 FORJ=1TO(LEN(C$)-1):PRINTTAB(20+1-LEN(C$))"-";:NEXT:PRINT
READY.
```

*Useful hint, Mr Smith. Did you see Tommy's Tip on how to employ the user defined function to line up decimal places, in the last issue? There has been some gossip about including 'Print Using' in the next revision of BASIC; that would be good news.*

## POWER FROM PET

The cassette motor outputs (rated 9 watts at 9 volts) are a useful source of power for driving external mechanisms, but readers may have experienced difficulty in controlling them, in that the switch-on command (POKE 59411,53), effective with the old ROMs, does not work with the new. The trouble is the keyboard scanning routine, which interrupts the program 60 times a second and switches off the motor by setting bit 3, producing a bit-pattern of 61 decimal - the switch-off poke. Readers may therefore be interested in a particularly simple way round the problem, which relies on the fact that the keyboard scan is disabled by clearing bit 0 of the same address. Thus with a POKE 59411,53 we switch on cassette No.1 motor and at the same time disable the keyboard scan, thereby ensuring that the motor stays on until switched off by POKEing 61 (or 53) into the address. Of course, since the keyboard is disabled, these commands must be entered from within a program; a POKE 59411,53 in direct mode will start the motor but crash the system.

It might be thought that all keyboard control is inevitably lost while the motor is running but such is not the case. The "column select" (bits 0-3 at 59408) becomes stuck at 9, allowing any key closure in column 9 to be detected by checking for the appropriate zero in location 59410 (all 1's for no key closure). Of the seven available keys the most convenient for this purpose is the space bar, signalled by a zero in bit 2, i.e., we test for 251 in location 59410. Thus the following routine will switch on cassette No.1 motor for about 4 seconds or until the space bar is pressed. This space bar over-ride will not jump out of a program or interfere with any subsequent data input from the keyboard.

```
10 POKE 59411,53
20 FOR I = 1 TO 400
30 IF PEEK(59410) = 251 THEN 50
40 NEXT
50 POKE 59411,61
```

E.P.C. Sington,
New Amberden Hall,
Debden Green,
Saffron Walden, Essex

*That sounds like a useful addition to the treasury of PET information, Mr Sington. We do, however, urge caution on readers who plan to use this as a power source. In particular, be sure not to use the other cassette motor output at the same time.*

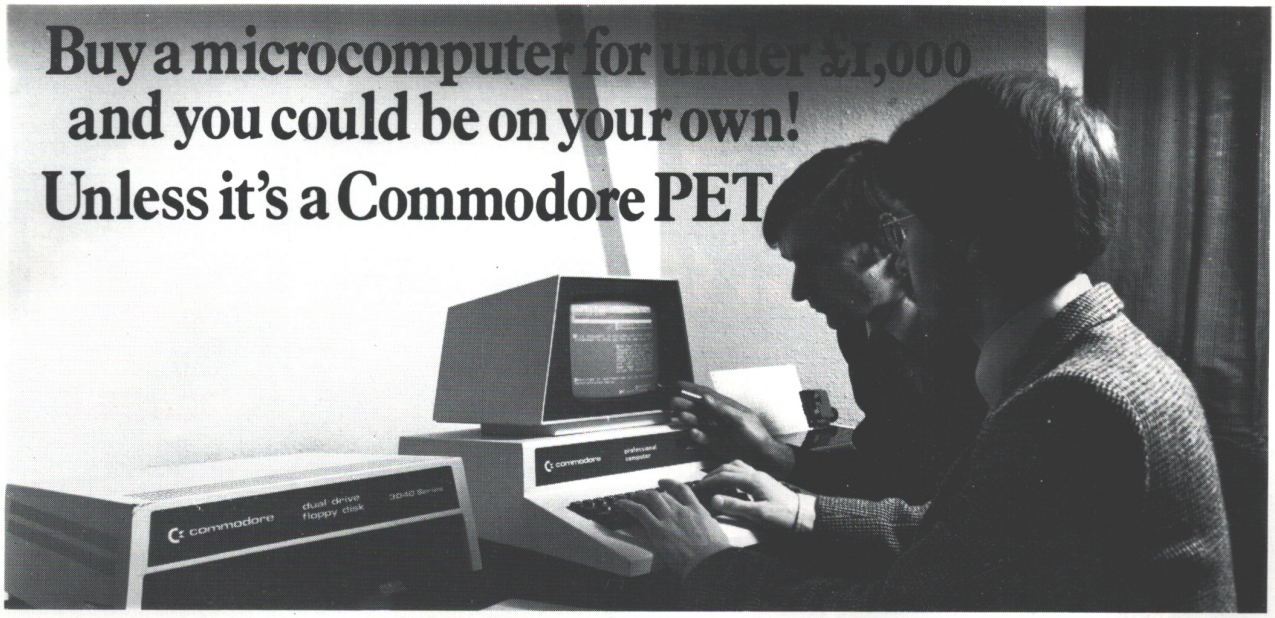
## AND NOW FOR 1981

Please RENEW my subscription to PRINTOUT; cheque for £9.50 enclosed. Thanks for the BEST magazine for PET/CBM users.

Gordon S. McKean,
Lovers Walk,
Dumfries

*Thanks for the kind words, Gordon. We have been delighted by the torrent of renewals. Anyone who has not yet renewed their subscription to Volume II, please send us your cheque as quickly as possible to ensure that the next issue reaches you without interruption.*

# Buy a microcomputer for under £1,000 and you could be on your own! Unless it's a Commodore PET




Commodore produce Britain's number one microcomputer. But we don't stop there. We also insist on providing comprehensive support throughout our national dealer network.

Our dealers can examine your needs and demonstrate which hardware and software will suit you best. Their trained engineers are always at hand and a 24-hour field maintenance service is available. Your local dealer can tell you more about the following Commodore Services.

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The Commodore PET computer range covers everything from the self-contained unit at under £500 to complete business systems at under £2,500.

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Our software range covers hundreds of applications. Business software includes Sales and Purchase Ledgers, Accounting, Stock Control, Payroll, Word Processing and more. In addition over 50 Petpacks are available covering such titles as Strathclyde Basic Tutorial, Assembler Development System, Statistics, plus our Treasure Trove and Arcade series of games.

### Commodore Approved Products

Compatible products of other manufacturers with Commodore's mark of approval are also available.

### Commodore Courses

Commodore offer a range of residential training courses and one day seminars. An excellent start. And when you have installed your system the PET User's Club Newsletter can keep you informed of new ideas and latest developments.

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# HOTLINE NEWS

## PRINTOUT EXCLUSIVE:

Following Inside Trader's report last issue that the Programmers Toolkit was being pirated by a U.K. company, the Toolkit's importers have reacted swiftly and legal action is now believed to be imminent. Zynar Systems, a subsidiary of the Rank Organization are gathering evidence of alleged copyright infringement by a wellknown dealer.

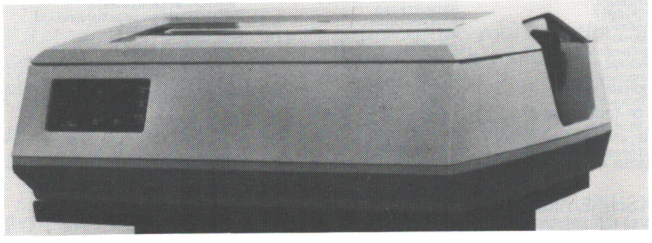
"One of the advantages of being part of a very large corporation is that you have access to unlimited legal resources" Colin Crook, Zynar's Managing Director told PRINTOUT, "and we intend to use them to protect our copyright."

But can Zynar win? PRINTOUT contacted Britain's leading expert, barrister Alastair Kelman. "To succeed the plaintiff would have to be a large company which can give an adequate cross-undertaking in damages if the case goes against them" he said. "Nevertheless, notwithstanding Vice Chancellor Megarry's statement concerning programs in ROM [in the Sinclair case], it is my view that a computer program permanently recorded in magnetic or optical media of any kind is protected as a literary work under the Copyright Act of 1956."

It looks as if that view will shortly be put to the test.

## NEW COMMODORE BUSINESS PRINTER

A fast new dot matrix printer, designated the 8024, has been announced by Commodore. Intended to complement the 8032 SuperPET and 8050 disk drives, the new, tractor feed printer has the standard ASCII 96 characters and operates at a snappy 160 characters per second. Double width characters can be generated under software control and up to 132 columns accommodated. The price is £1,160.



## CURSOR'S BACK!

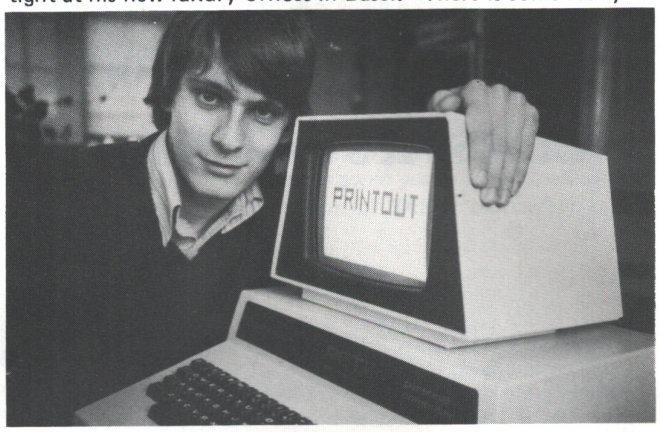
Great news — our favourite cassette magazine, Cursor, is back after a couple of months hiatus and a change of distributors. Publication is now down to six copies a year, at a cost of £21 inclusive of postage. Single copies, including back issues are also available, price £3.75 post free from Audiogenic Ltd., P.O. Box 88, Reading.

## FOUR STAR MYSTERY

Landsler Software sent us a press release about their Hotel Guest Billing Program. Apparently it has been licenced in the U.S., Hong Kong, South Africa and just about everywhere else you can think of, plus several places you can't. It is also said to be running in one four-star British hotel. But which one? Ted Landsler wasn't saying. However, our intrepid publisher reports that whilst on his annual gastronomic tour of the Lake District, he encountered a PET at the Lodor Swiss Hotel. Next time you are overcharged at a hotel and they blame 'computer error', ring Landsler to complain. His number is 01-399 2476.

## IF YOU CAN'T BEAT 'EM....

Richard Pawson, PRINTOUT's first editor has joined Commodore Electronics - that's the International division based in Switzerland - as Software Manager. But he won't be sitting tight at his new luxury offices in Basel. "There is some really




excellent software coming out now, and it will be my job to ensure it reaches PET users throughout the world," he says. However, Richard hasn't entirely severed his connections with PRINTOUT, and will be filing reports on PET activities in some of the further flung corners of the Commodore's Empire.

## PET MAINTENANCE

PET problems? Compufix could be the people you need. David Lines runs this Newbury-based company offering fast repairs. Their engineers are equipped with the latest in PET diagnostics. They also offer maintenance contracts at 10% of the retail price for 48 hour service or 13% for callout within 24 hours. Contact them at 44 Robertsfield, Thatcham, Newbury, Berkshire, telephone 0635-67983.

## NEWS FROM AMERICA: PET PROGRAMMABLE CHARACTER GENERATOR

News reaches us of a new device that allows you to program up to 64 of your own characters - including a proper pound sign! The HAL PCG6500 interfaces to PET/CBMs with 24 pin ROMs and operates fully independently of user memory. The software needed to write programs using the programmed characters is included; the special routine is not required for displaying the characters. The unit also has a built-in CB2 type sound amplifier. The price is $200 from Systems Formulate Corporation, 39 Town and Country Village, Palo Alto, CA 94301, telephone 0101-415-326-9100. The easiest way to place an order is probably by quoting your Access or Visa card number. Our advice when ordering anything from America is to send for details first.

## TINY PASCAL

Abacus Software have announced a version of Tiny Pascal for the PET. Available on cassette for $35 or on diskette at $40 for 16K or 32K new ROM PETs, the package is a sub-set of the standard Pascal language. It includes the structured programming features IF–THEN–ELSE, REPEAT–UNTIL, FOR–TO/DOWNTO–DO, WHILE–DO, CASE–OF–ELSE, FUNC and PROC. Programs written in Tiny Pascal can be created, compiled and executed. Both source and object code can be saved on cassette or diskette. For further information contact Abacus Software, P.O. Box 7211, Grand Rapids, Michigan 49510, U.S.A. The manual is available separately for $10, refundable with software order. They accept Access/Mastercharge or Visa.

## NEW CHARACTER SET ROMs

PET users with a scientific or technical background will welcome the appearance of a new character set which allows the PET to display mathematical formulae and expressions. At Power-On everything looks normal, but once the system is POKEd into lower case mode, the graphics characters are found to have been replaced by mathematical symbols such as superscripts, subscripts, square roots, integrals, derivatives and sums. The package is supplied as plug-in ROM chip and manual for new ROM 3000 series PET/CBMs. Also available

*Continued on page 14*

# Commodore approval is your guarantee of quality.

As well as manufacturing Europe's number one micro-computer, Commodore have officially approved a range of PET compatible products, a selection of which is featured below.

Post the coupon for our comprehensive brochure of approved products, or contact the supplier direct.

OFFICIALLY APPROVED BY COMMODORE

IJJ are the sole distributors in the UK for the outstanding MTU High Resolution Graphics system for the PET.
This provides the following features:
320 x 200 dot matrix, fully addressable.
Advanced machine code handler included (disk or cassette).
Straightforward to use, with 19 extra BASIC keywords.
8K extra memory when graphics not in use.
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Simple fitting within the PET using mounting bracket supplied.
Plugs into memory expansion socket.
Only 3 wires to be soldered for raw do. supply.
All-inclusive price £320 (+VAT).

IJJ DESIGN LIMITED,
37 London Road, Marlborough,
Wilts SN8 2AA. Tel: (0672) 54487.

Mitrelynn have produced an Acoustic Cover specifically designed to reduce the noise level of the Commodore Tractor Printer by some 80%.

Made of fire retardant styrene plastic with a leather-grained finish, the cover is lined internally with acoustically absorbent poly-urethane foam treated to minimise dust.

All printer functions are easily accessible.

MITRELYNN Mitrelynn Limited,
159/161 High Street, Sawston, Cambridge.
Tel: 0223 835792 Telex 817855

FILEPROG, a disk based visual search and display filing system of up to 3000 records showing name, address, telephone number, notes, product and area codes.

Seven print facilities for mailing list, company list, self-adhesive labels or area list.

Full self checking back up routines ensure data cannot be accidentally lost.

AMPLICON MICRO SYSTEMS LIMITED
AMPLICON 143 Ditchling Road, Brighton, E. Sussex, BN1 6JA.
Tel: (0273) 562163
Stephenson Way, Three Bridges, Crawley, W. Sussex, RH10 1TN. Tel: (0293) 26493.

The only manufacturer of approved interfaces for the Commodore PET * Type C: PET to RS232 * Type B: PET to RS232 bidirectional * TV monitor interface * A.P.: PET to parallel * G.P.I. micro based interface programmed for your interface requirements * Complete word processing systems * Custom interfacing * Full range of CBM equipment * Ricoh RP1600 daisy wheel printers complete with integral addressable interface Ex. Stock.

Small Systems Engineering Limited,
2-4 Canfield Place, London NW6 3BT.
Tel: 01-328 7145/6 Telex 8813085 (Abacus)

8000 + 3000 Series Products for both the Businessman and Accountant in Practice.
Incomplete Records Accounting,
Sales, Purchase and Nominal Ledgers,
Time Records Costing,
VAT Special Retailers Schemes,
Backed by around 200 live installations in Accountants' Practices throughout the U.K.
C.S.M. set the standard for Accounting Software.

Computer Services Midlands Limited,
SM Refuge Assurance House,
Sutton New Road, Erdington,
Birmingham B23 6QX.
021-382 4171 (4 lines).

KRAM (Keyed Random Access Method) adds 10 functions to Basic in the 40/80 column PET, to give complete and easy control of disk data. KRAM is based on state-of-the-art VSAM mainframe techniques, giving fast keyed access to the 3040/8050 disks and maximizing disk capacity. Essential for business users. £100.00 + VAT.

**Calco Software**

Lakeside House, Kingston Hill,
Surrey KT2 7QT. Tel: 01-546 7256

MUPET is very good news if you require a multi-user word-processing system but up until now have run up against a budgetary brick wall.

MUPET makes the most of WORD CRAFT or WORDPRO IV by linking 2 or more PETS to a single disk-drive and your choice of quality printer.

Priced from £495 + VAT.
KOBRA MICROSYSTEMS
KOBRA 14 Broadway, West Ealing,
London W13 0SR.
01-579 5845.

Constructional Software is a library of programs for the construction industry with applications for Engineers, Architects, Quantity Surveyors and Contractors. Frame analysis, heat loss, drainage design, specification preparation, critical path analysis and resource allocation on 40 and 80 column PETs.

Claremont Controls Ltd.,
Chimney Mill, Newcastle upon Tyne, NE2 4AL.
Telephone (0632) 610210.

commodore

To: Commodore Information Centre,
360 Euston Road, London NW1 3BL.
01-388 5702.

Please send me further information about the Commodore PET Approved Products range.

Name_____
Position_____
Address_____

Intended application_____
Do you own a PET? YES☐ NO☐

*Continued from page 12*

from the same source is a foreign language ROM which provides the special extra characters necessary for French, Spanish, German and Slavic languages. The price for each ROM set is $75 from West River Electronics R and D, P.O. Box 605, Stoney Brook, New York 11790, U.S.A.

## WORLD BEATS PATH TO SLOUGH

Commodore brass, including Chairman Irving Gould and President Jack Tramiel, rubbed shoulders with British and European PET dealers at a special, trade-only, software show, held at Heathrow's Skyway Hotel recently. One non-Commodore dealer who slipped in, left looking shaken. "I had no idea there was so much software available," he said. "There is no way Apple and Co. can compete with that lot."

"That lot" included some impressive-looking software for the 80 column SuperPET. PRINTOUT liked the look of, and will shortly be reviewing, a new database system called 'OZZ - The Information Wizard' which Commodore will be marketing. Other CBM packages for the 8000 series on show were 'The Accountant', 'Paymaster' and 'Stock Controller'. No prizes for guessing what they do.

The show also provided an opportunity for dealers to examine the offerings of independent software producers participating in the Approved Products scheme. New packages included an Incomplete Records System for both 3000 and 8000 series machines by Computer Services Midlands, and an Advanced Business Package consisting of Invoicing, Stock Control and Sales Ledger from LD Computer Services of Newmarket, Suffolk. We will be evaluating these in forthcoming issues.

## PETs IN THE SOUTH EAST

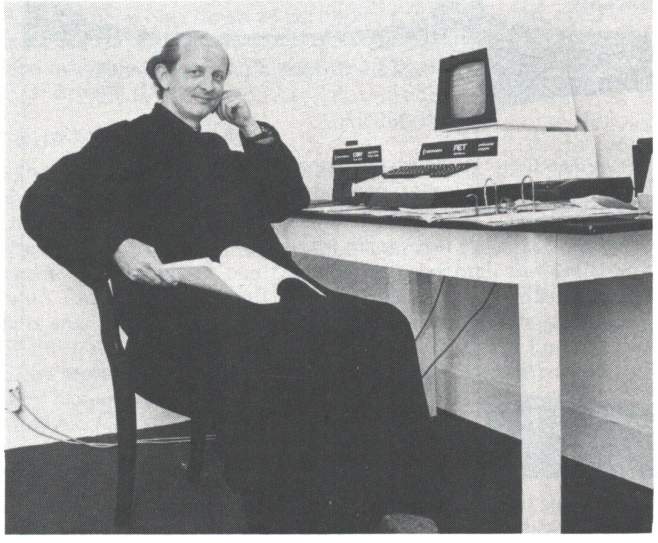
One of the most active of the local PET groups is the Independent PET Users Group - South East Region, who meet on the 3rd Thursday of each month. They also produce a professional looking newsletter. Details from Mike Ryan, 164 Chesterfield Drive, Sevenoaks. Tel. 0732-53530.

## DMS ON THE SUPERPET

Compsoft's Data Management System is now available for the 8000 series. Users can store information in a format they themselves specify. Records can then be selected using up to four search criteria, and displayed on screen or printer. What is unusual about DMS is its ability to perform complex calculations wherever the user stores numeric information. Details from the lovely Heather Kearsley on 0483-39665.

## MICRO CHIP MONK

Meet one of the West Country's newest PET users - Father Richard of Buckfast Abbey, where Devon Computers have installed a 32K PET, disk drive and printer. So far they have a stock control program up and running. What about games? Father Richard merely smiles. We are sending him a copy of Space Invaders.

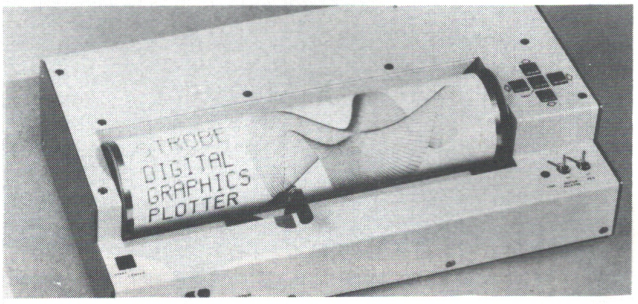


## HAL PLOTS

Remember HAL, the computer that went beserk in '2001 - A Space Odyssey'? It was no surprise then to hear from HAL Computers with news that they were plotting. In colour. At low cost. £545 actually; which is not a lot for a colour graphics plotter capable of steps as small as .004 of an inch.

The Strobe model 100 comes complete with hardware interface and software driver for the PET. There is even an optional plot software package providing vector generation and alphanumerics, should you want it.

Something about HAL's letterheading seemed rather familiar. It wasn't until we changed each letter to its alphabetical successor that we realized who they reminded us of. Obviously a plot.




## USER FRIENDLY

Programming problems? Help is at hand. The Programmer's Friend is a comprehensive new set of disk-based programs developed by Chris Preston, author of the 'HitchHiker's Guide to the PET'. Included are all the Toolkit functions plus several new ones that should make debugging a doddle.

The BREAK command allows the user to stop the program at any time without losing any of the program variables. MERGE merges two programs from disk; they needn't have different line numbers either so it is a true Merge and not an Append. UNBRK removes a break point.

The proliferation of ROM based utilities has already put a premium on the ROM expansion sockets, hence Petsoft's decision to release the Programmer's Friend on disk. The price is £25 and details are available from 66/68 Hagley Road, Edgbaston, Birmingham, tel. 021-455 8585. We will be putting Petsoft's claim that it "greatly reduces program development time" to the test, but first reaction is that it is like having Tommy Turnbull sitting on your knee. Permanently.

## MICRO MAGIC

Wizards are an odd bunch. Our favourite is Alastair Crowley, the self-styled 'Great Beast'. Pressed by his followers to conjure up the devil in 1921, Crowley was so alarmed when he succeeded that he immediately retired to Italy.

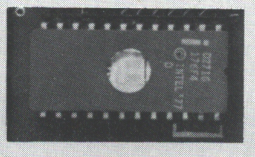
Now a new magician is amongst us: OZZ the Information Wizard, a database package developed by the unmagical sounding Bristol Software Factory and marketed by Commodore. Written entirely in machine code it deploys a database editor to draw a form on the screen. Up to ten different forms can be created and matching files opened. Automatic File Management allows each file to grow in size as more information is entered. Searching is by relative record number or name.

There is a touch of wizardry about the way in which the built-in programmable calculator performs. You can enter a command like 'INVOICE TOTAL=GOODS TOTAL + POSTAGE' and OZZ will execute it. There is also a powerful Analysis feature that would allow you to produce a list of all customers in Newbury with accounts more than £50 overdue and names beginning with P, and total their turnover. Oh dear, that sounds like us...

# Freedom for the PET... and the busy user. Now PET users can achieve previously 'impossible' configurations without recourse to tedious machine code routines.

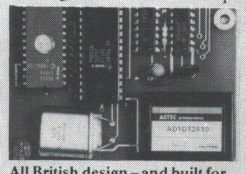
# THE KC NETKIT
# A new concept hardware/firmware package from Kingston.

We're in the age of day to day communications between computers–and the age of tight budgeting.
The KC Netkit hardware/firmware package from Kingston comes to your aid by dramatically widening the scope of the PET without great additional cost.

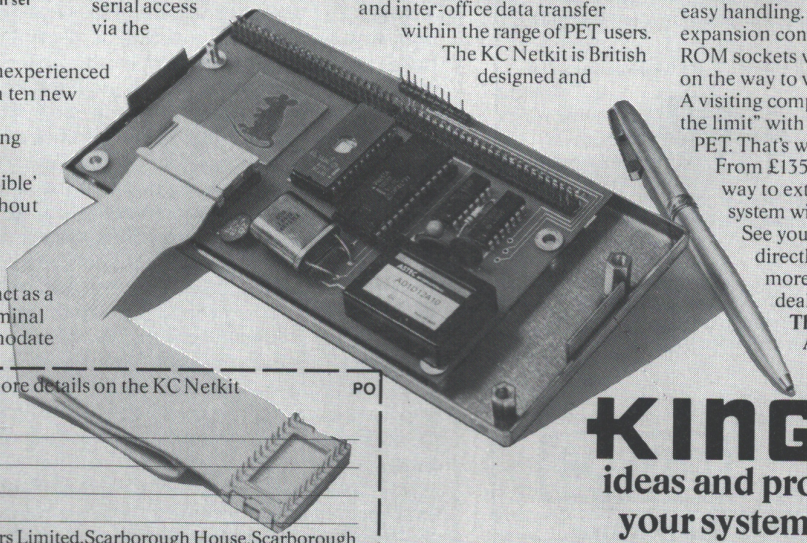


**The core of the Netkit system is an ingenious instruction set on ROM.**

How does it work?
It frees the PET from many of the limitations associated with the creation of RS232C (V24) serial access via the IEEE 488 port.
It assists busy or inexperienced programmers with ten new SERIAL BASIC commands, enabling them to achieve previously 'impossible' configurations without hours of tedious machine code routines.
The PET can now act as a smart or dumb terminal which can accommodate most of the protocol and character conversion that the user may require. Using the KC Netkit, the PET can now exchange data and programme files freely. It can be remotely controlled and can open up a wide range of high speed networking. It can be grouped with other PETs to achieve greater real time number cracking power.
More Powerful. In short it makes the PET a more powerful beast...bringing electronic mail and data retrieval systems like Viewdata, multi-access and user applications and inter-office data transfer within the range of PET users.
The KC Netkit is British designed and developed by the manufacturers, Kingston Computers, part of the £25m Dale Electric Group. who make standby power systems for industrial-type computers.
The new product is the result of months of intensive research and development work and comes to the PET user only after thorough and prolonged testing. There is a generous 12 month parts and labour guarantee, backed by your dealer, Kingston Computers and the Dale Group.
The KC Netkit comes in a handsome black enamel, all-round case for easy handling. Just plug in, at the PET memory expansion connection and to one of the free ROM sockets with a ribbon cable, and you're on the way to working PET in a network.
A visiting computer enthusiast said "the sky's the limit" with KC Netkit and the Basic Serial PET. That's with anything except the price.
From £135, the KC Netkit is an inexpensive way to extend and develop your PET system without additional cost or trouble.
See your Kingston dealer, or write directly to Kingston Computers for more details, name and address of dealer or distributor.



**All British design – and built for quality and reliability.**



**The KC Netkit from just £135. A dramatic new freedom for the PET. COMPLETE THE COUPON TODAY.**

Please send me more details on the KC Netkit PO

Name

Address

Kingston Computers Limited, Scarborough House, Scarborough Road, Bridlington YO16 5NS. Telephone: 0262 73036.

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The Commodore range of Petpack Software is big and getting bigger! At the moment there are over 60 Petpacks and new programs are being added all the time. Here at Audiogenic we hold stocks of every Petpack and GD series disc, ready for immediate despatch.

For the Businessman we have programs for Stock Control, Filing, Accounts, Payroll, a very powerful Word Processor, and more!

For Eductional applications we have programs to aid in the tuition of Languages, Physics, Maths, English, Pet Programming, Statistics, etc.

For the Scientist or Engineer we have programs on Mechanics of Materials, Harmonic Analysis, Circuit Design, Drawing Load and Die Design, Statistical Analysis, Geometry and Algebra, to mention but a few. Then for the Programmer, there is a selection of Programming Aids on cassette and disc. And, of course, there are the Games Petpacks! Fun for all the Family! There are at present 12 cassettes in the Treasure Trove series, with over 40 different games in all. The Arcade series has 6 games which will be familiar to those of you who frequent pubs, clubs or amusement arcades. The games are PET versions of those popular pastimes like the addictive 'Space Invaders' or the universe-encompassing 3D Startrek.

**Get our catalogue for the exciting details.**

We also supply for your PET

**CONNECTICUT MICRO**

A range of analog to digital conversion equipment with up to 16 inputs for the collection of information. Temperature probes and software provided, all at prices starting at around £90.00. Also a range of IEEE to RS232 converters which are addressable and uni- or bi-directional. Prices start at £65.00

**A B COMPUTERS VISIBLE MUSIC MONITOR**

This unit is absolutely phenomenal. It actually displays music (staves, notes, signature etc.) on the screen and plays it at the same time. It will handle 4 part harmonies and you can add or delete notes with simple keyboard commands. It's a sort of musical word processor. Ideal for computer music freaks, whether rock, classical or budding "Stockhausens". Comes complete with notes, 8 bit D/A converter and some beautiful pieces of music inc. Maple Leaf Rag and some Bach. Excellent value at £39.50 inc. VAT plus 25p P+P.

**PROMINICO X-DOS**

This litte ROM makes all the difference to using disks, as it gives a range of commands like MENU, which displays the disc directory in the form of pages. It does not lose the program currently resident in the PET, and does away with initialisation. It also incorporates a screen dump to printer, disk copy and scratch routines. See our catalogue for further details.

**JCL EPROM BURNERS**

An essential device for programmers wishing to incorporate their programs into ROMs. Comes complete with software. Another nice little number from this company is the TURNKEY ROM set, which is suited to business software writers and users. It will load from disk a program as soon as you power up - also features a "BULLET PROOF" input routine. See our catalogue for the details of this versatile little beauty.

**BOOKS**

Over 15 titles from Prentice Hall International, OSBORNE/McGraw-Hill, BYTE BOOKS, SIGMA, and **COMPUTABITS.** All the titles have been selected with the PET user in mind, and the range includes books on PASCAL, GRAPHICS, PROGRAMS, IEEE BUS, CIRCUITS, HARDWARE, etc. Don't forget the PET/CBM Personal Computer Guide at £9.25 plus £1.00 p+p.

**BASIC 4 and DOS 2 CONVERSION**

BASIC 4 gives your new ROM PET all the commands of the new 80 column PETs. DOS 2 goes in your disk drive and is necessary when using BASIC 4 or may be used on its own to get rid of initialisations every time you use a disk. Both sets are priced at £43.70 inc. VAT + 50p P+P each.

**ACCESSORIES**

SOUND BOARDS, DISKS, CASSETTES, ROMS, DISK HOLDERS, PETSET (GETS YOU OUT OF CRASH), DEMAGNETISER, RIBBONS see catalogue for full details.

**Now 22 issues of this superb magazine.**
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# PETS & PIECES

## by Gavin Sanders

**Have I Got News For You!**

My only degree qualification (from longer ago than I want to remember) is psychology, which gives me an inalienable right to yak on about things like 'rationalisation'. Which is what I **am** going to mention now. 'Rationalisation' is the art of explaining personally-induced errors, to which we're all prone, by attributing them to something else entirely. OK so far? Fine.

Now here comes the news, and this year's best bit of useable rationalisation to boot. Not a lot of people know this (if Mike Caine will forgive me), but 1976 saw the start of a sun-spot cycle, a phenomenon which comes round every 11 years. Three years later, a cycle reaches its peak, and the worst effects go on for two to three years from then. That's like from now till about 1983.

What respected American scientists are now saying is that sun-spot activity can do other things than, for instance, cause skin cancer (you have to admit my column is always cheery). They've now found that - and it's their phrase, not mine - 'computational errors' can be attributed to sun-spots. Apparently, atomic particles float down to earth and cause 'soft fails', which randomly invert the values of computer-stored bits.

So, from now till 1983, there's going to be a huge increase in inexplicable computer errors with, and this makes it even better, a far greater risk at higher altitudes.

Right, let's start rehearsing. The Sanders School Of Dramatic Art is now in session. The scene: your office or the room at home where your PET is; it's not important. The time: several weeks after you've started on the program to end 'em all, in terms of simple, devastating, brilliance. The situation: a total programming impasse, where nothing you do goes right. The cast: you and your boss or wife; again, it doesn't matter.

**They've** just complained about the time you're taking. **You** turn airily, and assume a weary look to mask your seething frustration. Your line is easily learnt: "Look, my dear (if it's your wife; or 'sir' if it's your boss; or 'my dear sir' if they're one and the same person), there's an extraordinarily high degree of sun-spot activity at the moment, so I'm experiencing a number of soft-fails which are randomly inverting computer-stored bits. You can't expect me to hurry when outer space is against me." And if you live or work anywhere above the second-floor, don't forget to add: "Being so much closer to the sun than most people doesn't help either."

As always, however, the Sanders School of Dramatic Art accepts no responsibility for programmers who get thumped (or thrown from the top-floor of high-rise buildings) after delivering this response.

**On Guarantees and Things**

If you were with me last month, you'll remember my fulminations against mean, miserly, running-scared 90-day warranties, (though why people can't call them guarantees, I just don't know). Well, I'm delighted to flip the coin over this month, and talk about a guarantee that **is** a guarantee, and then some! And the nice thing is that I can name names, because I'm going to be really complimentary.

Kingston Computers are no strangers to PRINTOUT readers; anyone who hasn't noticed the Kingston Mighty Mouse in our advertising pages has been working through PRINTOUT with his or her eyes closed. Concealed in tiny print in the Kingston advertisement, however, is a reference to their guarantee, and now I've seen the guarantee in question, I can't understand why Kingston don't make one helluva lot more noise about it.

Get this. Kingston's first guarantee section is what they call "thirty-day buy back". Quite simply this means that, for 30 days after you've bought a Kingston product, they'll buy it back from you if you don't like it, or don't want it, or decide you don't need it. No questions, no quibbles - a simple straightforward offer. All you have to do is make sure it's undamaged and in the original packing. Do you know anyone else who does that?

Then comes a full 12 months guarantee, again unhedged by fiddly 'ifs and buts'. After that, if you've had a repair, you get a three month guarantee on whatever it was they fixed. And if all that wasn't enough, Kingston go overboard with the back-up service they offer. They guarantee to repair anything they've sold, should it need it, within two working days or **offer a loan unit if they can't.** And if a "critical system failure" occurs, involving a Kingston product, they further undertake to send you a free loan unit within **six hours** of you telling them. The freight charges are yours to pick up on this last, but it's still an offer, within a parcel of Kingston guarantees, that makes a lot of others look sick.

And regardless of whether Kingston advertise with us or not, it gives me a lot of pleasure to publicise the fact. Fear not, if they were dreadful, I'd still say so.

**A Neat Little Job**

For the last few weeks I've been using one of the nicest and best-made little add-ons for my PET that I've come across in a long while. Regular readers will know that I try to stay neutral, and only recommend those things I've genuinely found to be worthwile, so perhaps you'll take it from me that Pronto-Pet is all I say.

But what, you may well ask, is Pronto-Pet? And a good question too. Well my friends, ever since Jim Butterfield (I think it was) discovered that you could get out of a "crashed" Basic condition, with whatever program you'd been typing in still intact, various gizmos have appeared on the market to work the necessary magic.

The magic is simple enough, but a little fiddly to do for yourself - you have to short various user-port pins together, and so forth; the sort of thing that, at best, isn't easy and, at worst, is downright terrifying. Nightmares of blown ROMs, and all that sort of thing. Do everything right though, and you drop out of the "crash" and into the Monitor, from whence you emerge by typing "X". Then you simply go on to type CLR, and lo! you should be able (in the vast majority of cases) to list the program you'd otherwise have lost.

The available gizmos have done the nasty work for you, in that they did all the inter-connecting bits when you pressed a button, or flipped a switch. The end result has always been the same. The snag has been the somewhat cheap and tawdry appearance of the ones I've seen together with, on some of them, difficult little connections you had to make inside PET.

There's none of this with Pronto-Pet. It's a chunky little block, machined from solid aluminium alloy, anodised black, with a single push-button, and four leads. You simply push the latter on to four of the memory expansion pins (and which ones are unmistakably explained in the friendly little instruction leaflet), and you're in business. The block has a really solid "heft" to it, though it's only about 2" by 1" by ½", and it comes with a very thin self-adhesive pad which fixes it firmly and unobtrusively to the side of your PET.

The really good bit is the operation. Press the button and let it go quickly, and you get a "warm start" reset. Press it and let it go s-l-o-w-l-y, and you drop into the Monitor.

Sorry - there's an error in that last paragraph; the really good bit is the price of this little beauty. Would you believe just £9.50 - **including** VAT? Get yourself one for Christmas. They come from Calco Software who are at Lakeside House, Kingston Hill in Surrey.

**It's Not An Irish Joke!**

I'm indebted to a nice guy called Jeff Brown, who lives on the improbably-named Tullyglass Hill in Shannon, County Clare, for this next item. Jeff actually sent me a tape cassette of a program, and suggested I reproduce the listing, but it's a little long so I thought all you readers out there might like to have a go for yourselves with the principle instead.

Basically, Jeff's program puts a simple-looking sentence on the screen, and invites the user to count the letter Fs. There are only two provisos: count them only once, and don't go back over them several times (which is more or less the same thing, really).

Having done that, you enter the number of Fs you found, and nine times out of ten you're wrong. As indeed the program then maliciously proceeds to point out. Now I'm aware that forewarned is forearmed, so it may not work as well now, but here's Jeff's sentence. Don't cheat; simply count the Fs, then carry on reading.

FINISHED FILES ARE THE RE—
SULT OF YEARS OF SCIENTIF—
IC STUDY COMBINED WITH
THE EXPERIENCE OF YEARS.

OK, how many did you count? If it was less than six, you'd better go back and count again.

Now here's an interesting thing. I've seen a counting gimmick like this before, and it was even longer ago than that psychology degree I was mentioning at the start of this month's column. During the war (the **last** war, and I was only a **tiny** child!) in fact, when an American soldier seared himself into my memory with a neat trick, involving a packet of Camel cigarettes. To this day, Camel cigarettes carry, on the back of the pack, the same legend that they did then, all those years ago. It reads like this:

Don't look for premiums or
coupons, as the cost of
the tobaccos blended in
CAMEL cigarettes prohibits the use of them.

This time, you're asked to count the number of Es, upper or lower-case. Why not have a try. I'm not going to tell you how many here. You'll find it concealed in the middle of the next and final item, just to stop you peeking too soon.

I'll bet you one thing - you won't be right first time!

**Tailpiece**

The astonishing Mr Supersoft has been in touch with me again. In fact I think I'd go round the bend if I didn't get my monthly fix of some new and astounding goody from Peter Calver. This time it's a smart way of rescuing from oblivion any program that was in memory until you typed NEW without thinking.

If you then thought it was lost and gone forever, you were wrong. And there's a really neat way (there are eleven Es, believe it or not, in the Camel text mentioned in the previous item) of getting it back again provided you have a Toolkit (and which of us hasn't?). All you do is enter POKE 1026,4:SYS 50242 as a direct command, and then say very firmly to your PET, via a keyboard entry naturally, FIND IT. If you want to be especially polite, you could always say FIND IT PLEASE.

If you then type LIST and press return, tears of joy and gratitude will leap unbidden to your eyes.

That's all till next month folks. Go safely; hack well; and see you all next time.

**Speed up your PET programming with The BASIC Programmer's Toolkit,™ now only £30.00.**

Don't waste valuable programming time if there's an easier way to go. Here it is: The BASIC Programmer's Toolkit, created by Palo Alto ICs, a division of Nestar. The Toolkit is a set of super programming aids designed to enhance the writing, debugging and enhancing of BASIC programs for your PET.

# Increase your PET's IQ for £30

The BASIC Programmer's Toolkit has two kilobytes of ROM firmware on a single chip. This extra ROM store lets you avoid loading tapes or giving up valuable RAM storage. It plugs into a socket inside your PET system, or is mounted on a circuit board attached on the side of your PET, depending on which model you own.

There are basically two versions of PET. To determine which Toolkit you need, just turn on your PET. If you see ***COMMODORE BASIC*** your PET uses the TK-80P Toolkit. If you see ###COMMODORE BASIC###, your PET uses the TK-160 Toolkit. Other versions of the BASIC Programmer's Toolkit are available for PET systems that have been upgraded with additional memory.

**How Toolkit makes your programming easier:**

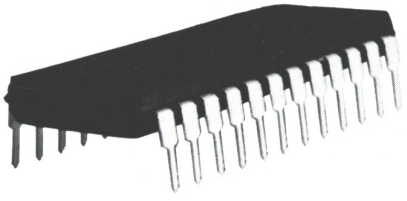
**FIND** locates and displays the BASIC program lines that contain a specified string, variable or keyword. If you were to type *FIND A$,100–500,* your PET's screen would display all lines between line numbers 100 and 500 that contain *A$.*

**RENUMBER** renumbers the entire program currently in your PET. You can instantly change all line numbers and all references to those numbers. For instance, to start the line numbers with 500 instead of 100, just use *RENUMBER 500.*

**HELP** is used when your program stops due to an error. Type *HELP,* and the line on which the error occurs will be shown. The erroneous portion of the line will be indicated in reverse video on the screen.

These simple commands, and the other seven listed on the screen, take the drudgery out of program development work. And for a very low cost. The BASIC Programmer's Toolkit costs as little as £30.00 or at most, £45.00.

Get the BASIC Programmer's Toolkit and find out how quick and easy program development can be. See your local PET dealer today.



PALO ALTO ICs
A Division of Nestar Systems, Incorporated

PET™ is a trademark of Commodore Business Machines, Inc. The BASIC Programmer's Toolkit™ is a trademark of Palo Alto ICs, a division of Nestar Systems, Inc.

The Toolkit is fully assembled. It is not a kit and requires no special tools to install.

## Contact your nearest Commodore dealer for the 'new deal' Toolkit

*Now made available at super low prices in Europe by Zynar Ltd., Nestar's European business partner*

ZYNAR 122/3 HIGH STREET · UXBRIDGE · MIDDX Telephone: Uxbridge (0895) 59831

# TOMMY'S TIPS

**The North of England PET guru with the amazing knack of finding things about and in PET that no one else seems to know. As always, the odds-on bet is that something on this page will be useful to you.**

### How to use the Status Word.

*Dear Tommy - can you explain about the ST values.*
*- H.T. McGuire*

PET uses the ST variable as a marker when reading files. Its prime use is to check certain Input/Output operations. There are six numbers which the ST variable can contain to signal various status conditions. These are: 4 for SHORT BLOCK, 8 LONG BLOCK, 16 UNRECOVERABLE READ ERROR, 32 CHECKSUM ERROR, 64 END OF FILE and 128 for END OF TAPE.

Sometimes the command ?ST will reveal none of these. If ST=52 for example, PET is telling you that more than one condition is present. In this case 52 = 32+16+4. Let's take a look at the different status conditions in a little more detail.

**Short Block** (4) signals an incorrect gap between data file records. This can be caused by reading a short BASIC program as a data file by accident. Even I have been known to do this!

**Long Block** (8) means the gap between data records is too long. This is also likely to have been caused by reading a program instead of a file.

**Unrecoverable Read Error** (16) will cause PET to abort the reading of a file and generate an error message instead. It happens when more than 31 errors are detected in a data file or program being loaded into PET. The correct procedure is to clean and demagnetize the tape deck, have a stiff drink and try again.

**Checksum Errors** can be irritating. When a program is being loaded or a file read, a checksum is computed over the bytes of RAM - PET does everything twice for the purpose. If the byte received from the tape or other input device fails to match, a checksum error is generated and 32 added to the contents of the variable ST. Next time you get a Verify Error check ST and you will see what I mean.

**End Of File** indicates the end of a data file to PET, so you can use it to test for End Of File when reading a tape.

**End Of Tape** tells PET there are no more data files on the tape and should abort the reading of a file if found, and generate the FILE NOT FOUND ERROR message.

To print an End Of File message on tape#1, you should open with: OPEN1,1,1. To print End of File and End of Tape use OPEN 1,1,2. With old ROM PETs it is always wise to test the ST during a file read after an Input. On new ROM PETs test it before the Input.

### Timing

*Dear Tommy - I need really accurate timing. What's the best method?*
*- Gerard Noel*

Forget FOR...NEXT loops and use the built-in clock instead. This routine should do the trick:

```
100 D=10:GOSUB5000
110 END
5000 X=D*60:T1=TI
5010 IF TI>T1+X THEN RETURN
5020 GOTO5010
```

By setting variable D to the number of seconds and executing GOSUB 5000 you will cause PET to wait until the selected time has elapsed.

### Auto Delete

*Dear Tommy - Is there any way of automatically deleting unwanted lines from a program?*
*- J. Bridicci*

Yes. Try the following. All you have to do is enter the start and end numbers of the lines you want deleted.

```
100 INPUT"ENTER START      NUMBER";A
105 INPUT"ENTER INCREMENT NUMBER";I
110 INPUT"ENTER END        NUMBER";B
115 PRINT"■"
120 IFPEEK(50500)=0THEN200
124 REM 125-140 NEW ROM ROUTINE
125 PRINT"■■■■";A
130 PRINT"A=";A+I;":B=";B;":I=";I;"
    :GOTO125":IFA>BTHENPRINT"■":GOTO300
140 POKE158,2:POKE623,13:POKE624,13
    :PRINT"■":END
150 END
200 REM OLD ROM ROUTINE
225 PRINT"■■■■";A
230 PRINT"A=";A+I;":B=";B;":I=";I;"
    :GOTO225":IFA>BTHENPRINT"■":GOTO300
240 POKE525,2:POKE527,13:POKE528,13
    :PRINT"■":END
300 REM END OF THIS PROGRAM
```

*Continued on page 20*

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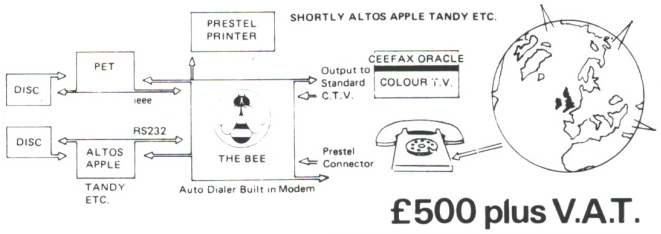


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CRA COMPUTER RETAILERS ASSOCIATION


*Continued from page 19*

**More on Cursor Positioning**

*Dear Tommy - In the last issue, Duncan Batey suggested a method of positioning the cursor on the screen without POKEing the screen directly. How can I use this for plotting?*
*- George Merryweather*

The following routine based on the Batey Method works on both old and new ROM PETs. All you have to do is enter the values to be plotted in DATA statements.

```
 5 PRINT"□":REM BASIC PLOT ROUTINE
 6 REM LIMIT OF X%=0-24(ROW)
 7 REM LIMIT OF Y%=0-39(COLUMN)
 8 REM SYS(X)=PART OF BASIC PRINT
   ROUTINE
10 X%=226:Y%=245:Z=58843:IFPEEK(50500)
   THENX%=198:Y%=216:Z=57949
20 READX,Y:IFX=-1THENGOTO60
30 POKEX%,X:POKEY%,Y:SYS(Z):PRINT"*"
   :GOTO20
50 DATA1,1,2,2,3,3,4,4,5,5,6,6,7,7,
   16,6,15,5,16,6,15,5,14,4,13,3,12,
   2,-1,-1
60 GETA$:IFA$=""THEN60
```

**Disk Security**

My piece on disk protection seems to have touched a raw nerve, so here is another routine that works on CompuThink drives. But be sure to write the name of the program somewhere safe or you won't be able to load it.

First, we must assign the program a name of more than sixteen letters length. Seventeen to twenty would be ideal, e.g. $S,1,"NR BIOLOGY CHOICE".

This will SAVE the program in the usual way. It can also be loaded normally - provided you remember its name. Because while the directory will indicate the number of tracks used, it will not display the program name! The use of seventeen character file names will similarly protect your Data files.

The best way to exploit this technique is to use a directory program like the one given below. After loading from drive one, use it to call hidden programs from the disk in drive two. At the end of your hidden program insert a routine to return to the index.

```
5 REM PUT THIS IN DRIVE 2
6 REM
7 REM HAVE HIDDEN PROGRAMS IN DRIVE 1
8 REM
10 PRINT"□ENTER NUMBER TO BE LOADED"
20 REM CLEAR INPUT BUFFER
30 GETA$:IFA$<>""THEN30
35 REM GET A NUMBER
40 GETA$:IFA$=""THEN40
50 IFVAL(A$)<1ORVAL(A$)>5THEN10
60 ON VAL(A$)GOTO 100,200,300,400,500
100 $L,2,"BR BIOLOGY CHOICE"
200 $L,2,"BR THIS IS A PROG"
300 $L,2,"NR THIS IS ANOTHER"
400 $L,2,"% THIS IS ANOTHER"
500 $L,2,"% THAT IS ANOTHER"
```

**Directory Display**

So how do we call the directory from a CompuThink disk and display it on screen? Here's how:

```
90 CLR:PRINT"□":DIMA$(40)
```

```
100 INPUT"DRIVE NO.";D
110 X%=158:IFPEEK(50500)=0THENX%=525
120 POKEX%,1:$D,D:PRINT"□":X=-1
150 PRINT:PRINT
160 FORI=S TO(S+15)
170 N=43776+I
180 A=PEEK(N)
190 A$=A$+CHR$(A)
200 NEXT:X=X+1:A$(X)=A$
210 IF A$="FREE TRACK
    "THENC=C+1:GOTO240
220 IFA$=B$THEN X=X-1:GOTO240
225 IFX/2=INT(X/2)THENPRINTTAB(20)X;
    A$(X):GOTO240
230 PRINTX;A$(X);
240 B$=A$:A$=""
250 S=S+25:IFC>1THEN290
260 IF S=1000THEN 280
270 GOTO160
280 PRINT
290 PRINT"REST FREE TRACKS"
300 PRINT:PRINT"■INPUT DIRECTORY
    NUMBER TO LOAD"
310 POKEX%,0:INPUT"■THAT PROGRAM
    *■■■■";C:IFC<10RC>XTHENPRINT"ERROR"
    :GOTO310
320 $X,D,A$(C)
```

The words "FREE TRACK" in line 210 must be followed by six spaces. This ensures that the string variable A$ will be exactly 16 characters long. Line 170 refers to the memory location of the beginning of the stored directory. Line 310 contains three Cursor Lefts back over an asterisk to prevent the dreaded null return.

When run, the program asks for the drive number, displays the directory for a second before building up a formatted directory on screen. Each program is accompanied by a number. Simply type that number - and Presto! Your program loads.

Since this is a short routine, you might want to end all your programs with a call to it. Then you can easily summon up any program on the disk. The cost to you? One track on each side of the disk. Well worth it for CompuThink owners.

**WARNING:** Do not use it to load Data files or you will suffer an 'orrible crash. To load machine code programs, be sure to change the X in line 320 to L, and, once loaded, SYS to your machine code start address.

Now let's hear from some of you Commodore disk owners.

### ROLLOVER BEETHOVEN

*Dear Tommy - Typing fast on my small keyboard PET - quite possible incidentally - I get wrong characters printed. Why?*
*- Jerry Markovich*

Your PET has a special memory buffer called roll-over which stores keystrokes it can't handle. If you type two keys simultaneously roll-over remembers one while the other is being printed. A bug in two-key roll-over causes the Space bar to be linked to the keys on either side with the result that an unwanted "less than" character can be generated. We can live with that.

Much more irritating is the unreliability of three-key rollover. This should remember the second and third keystroke when three keys have been depressed before the first is released. Instead, you get some very unsatisfactory results. Try it and you will see what I mean. They are caused by the way in which the PET decodes the keyboard strobe. For chapter and verse see Osborne's terse but useful PET/CBM Personal Computer Guide.


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# GOODIES OF THE BOLT ON KIND

★★★★★★★★★★★★★★★★★★★★★★★★

**Here is PRINTOUT's Christmas guide to all the wonderful things you can attach to your PET, specially compiled by the indefatigable RON GEERE. What's more, we have been able to negotiate special reductions for PRINTOUT readers on many of the products.**

*These special offer prices are listed in the text with the normal retail price in brackets, so be sure to mention PRINTOUT when sending for details or ordering. Offers are good until December 31st 1980. Thereafter please check with the supplier.*

★★★★★★★★★★★★★★★★★★★★★★★★

## THE CHIPS

### KRAM

**Calco Software, Lakeside House, Kingston Hill, Surrey**
**£115 inc. VAT (RRP)**

*KRAM stands for Keyed Random Access Method in case you didn't know (of course you did!). It is also a neat little ROM chip and disk based software system that give you ten new disk handling commands to give you control of your disk data, either directly by individual key, or sequentially in forward or reverse ASCII order. KRAM could save you an awful lot of grief.*

### TURNKEY ROMS

**JCL Software, 47 London Road, Southborough, Tunbridge Wells, Kent.**
**£120**

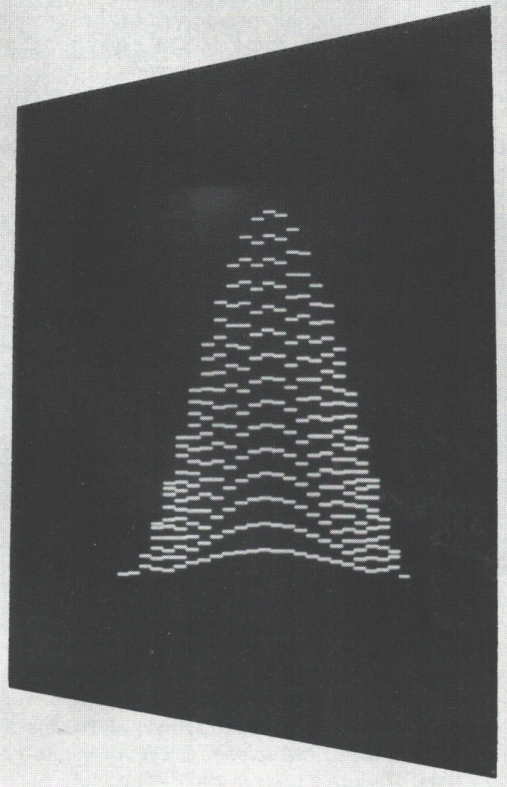
*Disk loading's a dream with these: just shut the flap and press the space bar twice to load the first program. The DOS support stamps smartly on several bugs rampant in Commodore's own DOS and there is also a Compatible Stop Key Mute and Repeat Key. Business users will like the Full Screen Input System which constrains the cursor to prompt fields anywhere on the screen and makes it jump between them. Other features include screen dump to printer and disk directory access from the program.*

### PROGRAMMERS TOOLKIT

**Available from most PET dealers or by mail order from Petsoft, 66-68 Hagley Road, Edgbaston, Birmingham B16**
**New price £30 (was £55)**

*Perhaps the best-known of all add-ons, this device has caused more PET users to 'lift the bonnet' than any equipment failure. It comes complete with a well written booklet explaining its 10 commandments, including FIND, DUMP, HELP, TRACE and AUTO. The PRINTOUT editorial team reckon they couldn't live without it, but experienced users will recognise its deficiencies. Two vital commands are missing, UNWIND, which straightens out one's nervous system, and DEBUG, which searches through your program and corrects all the errors!*

**PIC CHIP Insel Computer Ltd., 7 Bramshill Mansions, Dartmouth Park Hill, London N.W.5., and Petsoft.**
**£57. Manual only £5.**



*This ROM module goes some way to ease the programming of screen plots. Over 40 extra commands and their parameters give a new dimension to plotting with double-density or high-resolution on a single axis. The Graphics Extended BASIC commands are compact and easy to use. You can really bring some action to your screen with the facility to scroll and shift in all four directions, manipulate characters in a defined area, and perform single command plots of lines. In addition, a whole screen picture can be saved and subsequently re-instated, in fact several alternative pictures could be presented in this manner - now you see it, now you don't - magic, as they say.*

### SUPERCHIP

**Supersoft, 28 Burwood Avenue, Eastcote, Pinner, Middlesex**
**£45**

*Designed such that it complements and can cohabit with the Toolkit, this goody provides many functions of the 8032 SuperPETs.*

*A 'repeat' function can be applied to all keys or just a predetermined subset. Dwell and repeat rate can be programmed. Cursor flash rate increases during the repeat function, its normal rate also being programmable. Screen handling functions are orientated towards text handling. Insert and delete are provided for whole and part lines. Up and down scrolling can be effected with shifting the cursor, while up to 9 lines may be protected at the top of the screen.*

*The STOP key is used as an ASCII 'Control' key which changes the significance of other keys. 26 of the BASIC key-*

# GOODIES OF THE BOLT ON KIND

*words can be generated from Control-A to Control-Z. (Ugh - tokens again!).*

*If backtracking is your speciality, then RETRACE will take you on a journey back through time, well, at least as far as the previous 10 lines executed. All PET functions can be suspended and subsequently resumed.*

*SHRINK doesn't summon up the psycho, but removes all superfluous spaces and remarks.*

*'Reverse' acts on any rectangular area of the screen and is called by a SYS routine. Another SYS calls the 'Movit' subroutine which is a block move command.*

*Now the choice is yours; one of 10-user-defined routines can be called from a single numeric key on the key-pad in conjunction with the Control key. A further key enables a user-definable message.*

*Superchip comes complete with detailed driving instructions.*

## DIGITIZERS

### BITPAD DIGITIZER

**Terminal Display Systems, Hillside, Whitebirk Estate, Blackburn, Lancs.**
**£532**

*Has an 11" by 11" encoding area. Data is encoded using a stylus to select the desired co-ordinates to be encoded. These are then transmitted to the PET. There is a PET-compatible interface available.*

### PRESTO DIGITIZER

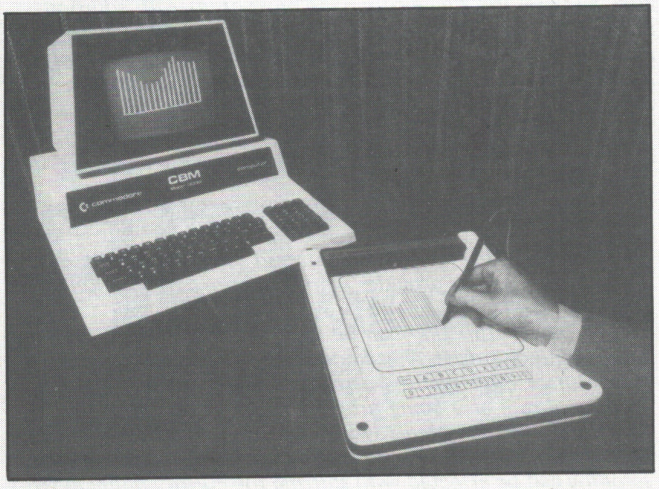
**Petsoft, 66/68 Hagley Road, Edgbaston, Birmingham**
**Special offer £29 (RRP £42)**

*A low cost pad which allows handwritten characters to be converted directly onto the screen. Great for games or if you can't type. The offer price is good value.*

### OCL DATAPAD (now renamed 'SAKER')

**Oxford Computing Services, 48 Crown Street, Reading, Berks**
**Special offer £445 (RRP £495)**

*Using a pre-planned entry format the DataPad can identify the A4 sized data sheet and its associated program. A special stylus eliminates typing errors by eliminating typing. Data is entered by a 'positional identifier'. Comprehensive graphics*



*software is included to enable stylus manipulation of the shapes. Ideal for people who cannot write for one reason or another.*

## THE INTERFACES

### TV INTERFACE

**Small Systems Engineering, 2/4 Canfield Place, London NW6**
**£35**

*Here is something to give that TV set something useful to do. Plug the interface into the User Port, power it from the rear cassette port and connect the RF output to the TV aerial input and within a few hours of groping around the TV for the tuning controls, you should have a copy of the PET screen picture on the TV. The unit is a well-made, professional quality product. Not the cheapest, but one of the best.*

*A cheaper TV interface is available from Qwerty Computer Services at £31.50 on special offer (RRP £42).*

### INTELLIGENT COMMUNICATIONS INTERFACES

**KC 1 and 2 (NETKIT)**
**Kingston Computers Ltd., Scarborough House, Scarborough Road, Bridlington, Yorks.**
**KC1 £135, KC2 £150**

*The KC1 and 2 from Kingston are something extraordinary in interfacing. At the risk of gross oversimplification, imagine if you will, a bi-directional RS232 interface which has a programmable code conversion capability and which, on input, can look as if entry is from the PET keyboard. The units have full modem control enabling interfacing via line link to another machine. The programming options for the unit are numerous and warrant an article in themselves. KC2 is essentially two KC1's and then some.....*

### USER PORT INTERFACE

**Amplicon Micro Systems Ltd., Richmond Road, Brighton**
**£65**

*Enables up to 5½ digits b.c.d (21 bits parallel) t.t.l. levels to be fed into PET via the user port.*

### INDUSTRIAL INTERFACES

**Stonefield Electronics, Denne Parade, Horsham, W. Sussex**
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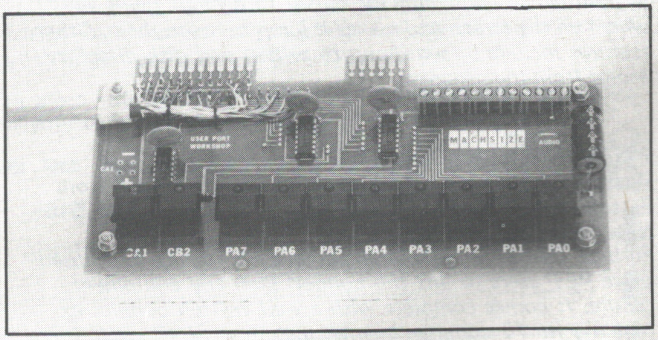


*Your workbench in this item is a circuit board, and to make it work there is an operating manual. Coupled with some software, you have 10 lamps and 10 switches and with a bit of PEEKing and POKEing, you are all set to compete with the Christmas tree. Might even teach one to program the peripheral chips, which is no mean feat.*

# GOODIES OF THE BOLT ON KIND

**INTERFACES FROM SMALL SYSTEMS, 3D, ANASPEC and AMPLICON.**

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*Plessey's 'INPET' memory board, as the name implies, fits inside the PET and can be used to expand the capacity of the 8K model. If the thought of lifting the bonnet and fitting it horrifies you, then for the expenditure of more money, there is the 'PETITE', a stand-alone mains powered unit. Available up to 32K in increments of 8K.*

**OMB MEMORY EXPANSION**
**OMB Electronics, Riverside, Eynsford, Kent DA4 0AE**
**Price: 8K £156, 32K £390.**

*An alternative memory expansion source comes from OMB in the form of a motherboard which houses four 8K memory boards.*

**S100 BUS CONVERTER**
**Amplicon Electronics, Richmond Road, Brighton, Sussex**
**£85**

*PET memory to S100 bus converter enables up to four S100 bus cards including low cost expansion memory with 4K and 8K PETs.*

## OTHER GOODIES

**LIGHT PEN**
**Qwerty Computer Services, 20 Worcester Road, Newton Hall, Durham**
**£15 special offer (RRP £25)**

*Quite a light pen this, weighing very little, it seemed to have almost magical properties. Pointing the pen tip at the appropriate part of the screen display is sensed by the software routines supplied with the unit. Very sensitive. Very inexpensive.*

**HIGH RESOLUTION GRAPHICS BOARD**
**IJJ Design, 37 London Road, Marlborough, Wilts SN8 2AA**
**£320.00**

*Nothing like being able to create real detailed pictures on the screen and even manipulate shapes to your satisfaction. Effectively replacing the character generator with 8K of addressable memory, one can control the individual pixels. A versatile software package makes the task of creating your favourite doodle that much easier.*

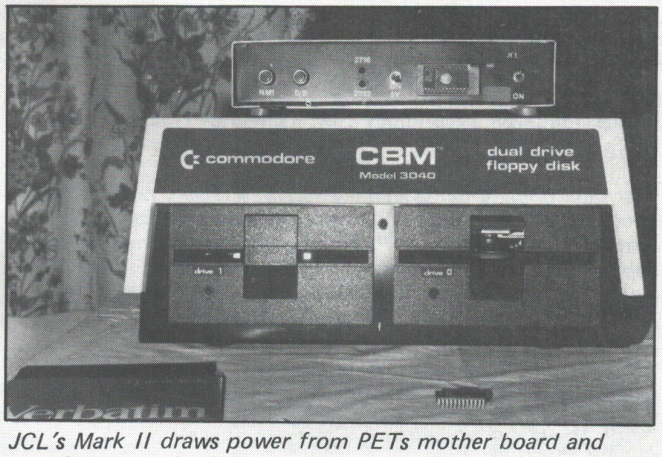
**EXTERNAL KEYBOARD**
**Petalect Electronic Services, 33/35 Portugal Road, Woking, Surrey**
**£89.50**

*Essential for that hands-on experience, or simply for playing duets, this keyboard is intended for 8K small-keyboard users whose fingers have outgrown the machine.*

**PROM PROGRAMMER**
**GR Electronics Ltd., Fairoak House, Church Road, Newport NPT 7EJ, Gwent**
**£92**

*Two versions of the programmer exist - one for 2516/2716 devices, the other for 2532/2732 EPROMs. Either plugs into almost every connector the PET has, and if you haven't a PROM to put in the socket, there is an extension cable available having a header at one end and another socket at the other. Important socket this, mounted on a plinth, answers to the name of ZIF (Zero Insertion Force).*

**EPROM PROGRAMMER**
**JCL Software, 47 London Road, Southborough, Tunbridge Wells, Kent.**
**£250**




*JCL's Mark II draws power from PETs mother board and transfers data via the user port without interfering with cassettes or disk drives. The software supplied with it allows RAM to be loaded, from a master EPROM, from binary files recorded by the monitor or from object files generated with CBM or JCL assemblers.*

**KINGSTON REPEAT KEY - KRK**
**Kingston Computers Ltd.**
**KRK1 £17.50, KRK2 £35**

*Also from Kingston Computers, this little gem comes in two versions. Version 1 is a hardware repeat function for the numeric/cursor pad. Most software versions require to be reactivated after cassette I/O, Version 2 is the GT deluxe model giving the repeat function on all keys and with a warm keyboard reset key incorporated, plus a selectable keyboard tone for touch entry (is there anyone out there typing with more than two fingers?)*

**SEQUENTIAL SWITCHING UNIT**
**Wego Computers Ltd., 22a High Street, Caterham, Surrey**
**£59.55 + VAT**

*Permits the sequential powering up, or in reverse sequence, power down of five mains powered devices, such as the PET and four peripherals. Each socket is rated at 1A, has its own neon indicator, and gives about 2 seconds power delay from the adjacent outlet.*

**PROGRAMMABLE STEPPER MOTOR DRIVE**
**Bentham Instruments Ltd., 14 Arkwright Road, Reading and Anaspec Laboratories, Bartholomew Street, Newbury**

*Driven from the IEEE-488 bus, this interface enables PET to control the speed and direction of a stepper motor. Several of these are all you need to complete that much-needed robot.....*

*The interface also provides the facility to step the motor manually as would be required for initial positioning.*

# GOODIES OF THE BOLT ON KIND

**BB DOS**
**B&B Computers, Suite 1, 124 Newport Street, Bolton, Lancs**
**Special offer £127.50 (RRP £150)**
*A disk operating system designed to enhance Commodore's own, with many of the features that attracted people to the CompuThink disk system. It also makes software developed on CompuThink disks capable of being run on Commodore drives. Transportable, as they say.*

**THE BEE**
**B&B Computers,**
**£575**
*Prestel facility for the PET. Add-on adaptor networks PET to the international standard. Deliveries said to be imminent.*

**PETELEX**
**Office Computer Techniques Ltd., Kimberley House, Vaughan Way, Leicester**

*Fast tape preparation system for telex, allowing rapid production, editing, storage and retrieval of telex messages. Low cost configuration hitches PET and cassette to an intelligent Paper Tape Reader Punch unit. Ritzier version uses CBM or CompuThink disks.*

**PRONTO–PET Hard/Soft Reset Switch**
**Calco Software, Lakeside House, Kingston Hill, Surrey**
**£9.99**
*A little different from the other reset switches, this. It is a single push button with a double action (sounds like a toothpaste, doesn't it?) generating either a complete reset or break to the machine code monitor so that you can save the program after a crash and - hopefully - find its cause. New ROMs only.*

**MINI HI–RES and CHARACTER GENERATOR**
**HB Computers, 22 Newland Street, Kettering, Northants.**
**£97**
*Tuck this neat little board inside PET and hey presto! you have a high resolution graphics 'window' on the screen. Its 1K of memory appears to sit on top of the character generator. When switched in it replaces the reverse field characters. You can also redefine characters to make special scientific symbols, pound signs, double width characters - or whatever you like.*

**DUSTCOVERS**
**Petsoft £5.75**
**Sumlock £6.50**
*A good idea - one of the PET Service engineers favourite tools is a can of compressed air for blowing dust away. Doubly necessary with disk drives and printers; Sumlock do covers for both priced £4.*

**BATTERY BACKUP**
**Banner Electric Co. Ltd., Pindar Road, Hoddesdon, Herts**
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**MARK SENSE CARD READER**
**Wego Computers**

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**BAR CODE READER**
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**£1175**
*If you've ever wondered what those funny lines on your cornflakes packets mean, this device will tell you. Expect to see it at the checkout of your supermarket where they will be using an infra red light code to read the bar code and convert it to ASCII for automatic tabulation of your bill, and probably stock control as well.*

**ODD ADD–ONS**
**Pedro Computer Services, 65 Glebe Crescent, Kenton, Middx**

*These are the 'things you can't get from elsewhere' department. The range includes a cassette port expander which enables one to connect a cassette deck while one of the other goodies steals the power source from the same socket. If three cassette decks are in use (!), then the outputs may be switch selected. The combined TV interface and CB-2 soundbox is ideal for demonstrations and exhibitions, while the combined CB-2 soundbox and cassette port soundbox comes with 'built-in auto-select switch'.*

*Apart from the above, soundboxes are also obtainable from IJJ Designs and Petsoft. Designs may vary in detail, so take your pick.*

## A BETTER CASSETTE DECK?

**PANTAL CASSETTE DECK £59.95**
**Available from: Tythe Aviation and PET Dealers**

Most of the early problems experienced with Commodore's own cassette deck seem, after no less than four changes to the electronics, to have abated. However, load errors do still occur, particularly when playing back recordings made on other decks or by commercial suppliers. These problems have been traced to various causes including instability of the record/play back heads. The Commodore units also have a marked tendency to magnetize themselves, a problem for which Commodore suggest regular cleaning with denatured alcohol or a proprietory head cleaner. Petsoft recommend their own cassette head demagnetizer, now on special offer at £9 plus VAT, and Audiogenics their mains-powered demagnetizer at £8.74 inc. VAT.

Is the new Pantal deck any improvement? Our tests suggest that it is. Construction and component quality are better than on the Commodore deck, the heads appear stable and it has a tape counter. This feature is especially useful for locating a particular program on a long tape.

In comparative tests the Pantal deck recorded a slightly higher drop-out rate when loading tapes made on Commodore decks; however, it had a higher tolerance of poorly recorded commerical programs than the Commodore unit. A test tape and instructions for head realignment were supplied with it.

A red LED indicates power to the unit and glows when data is being sent to the recorder. By adjusting the volume control it was possible to hear the program loading; this feature was well liked.

PRINTOUT Verdict: A good buy. For more information and the name of your nearest dealer, contact Tythe Aviation, 11 High Street, Leighton Buzzard, Beds. Tel: 372114.

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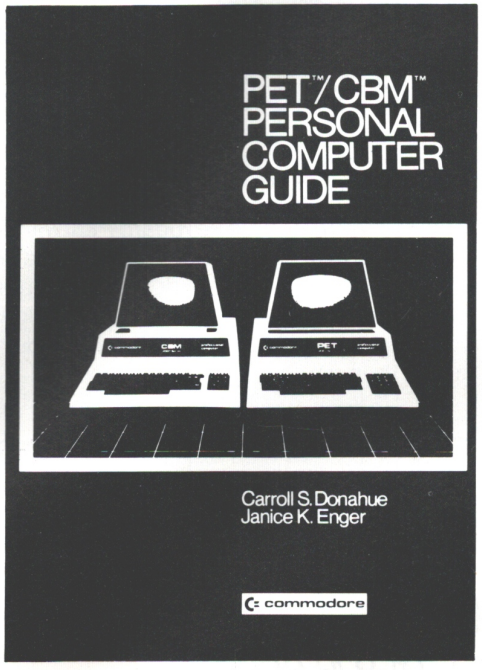


### BOOKS FOR THE PET / CBM

| | |
|---|---|
| 7.90 | Some Common Basic Programs (Pet/CBM) by Poole & Borchers |
| 9.20 | Pet/CBM Personal Computer Guide by Donahue & Enger |
| 9.50 | Pet & the IEEE-488 Bus by Fisher & Jensen |
| 10.00 | The Pet Revealed (2e) by Nick Hampshire |
| 10.00 | Library of Pet Subroutines by Nick Hampshire |
| 10.50 | 32 Basic Programs for the Pet by Rugg & Feldman |

### MACHINE CODE PROGRAMMING

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| 7.50 | 6502 Software Design by Leo Scanlon |
| 8.20 | C202 Programming the 6502 (2e) by Rodnay Zaks |
| 8.90 | 6502 Assembly Language Programming by Lance Leventhal |
| 8.90 | 6502 Software Gourmet Guide & Cookbook by Robert Findley |

### OTHER USEFUL BOOKS

| | |
|---|---|
| 5.30 | The Personal Computer Book by Robin Bradbeer |
| 5.40 | Microcomputers & the Three R's by Christine Doerr |
| 5.90 | Basic Computer Games by David Ahl |
| 5.90 | More Basic Computer Games by David Ahl |
| 7.20 | Microsoft Basic by Ken Knecht |

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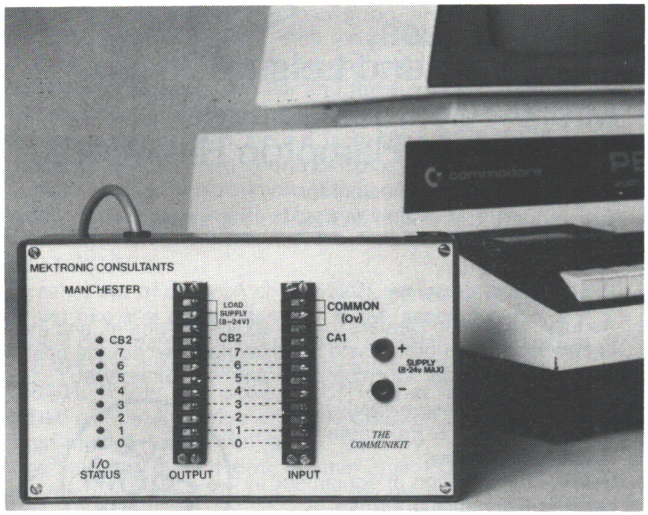


The Commodore PET Desk-Top Computer (and Rockwell AIM 65) can now talk to the outside world. The Communicator plugs into the user port and provides 8 channels. Each channel can be set as either an input or output and used with such inputs as switches, pushbuttons, thermostats and alarms, or with such outputs as lamps, relays, stepper motors and D to A converters.

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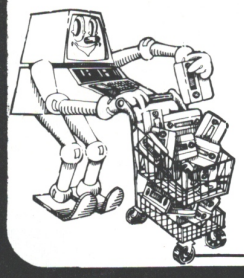

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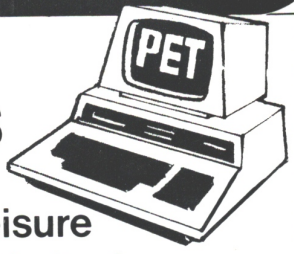


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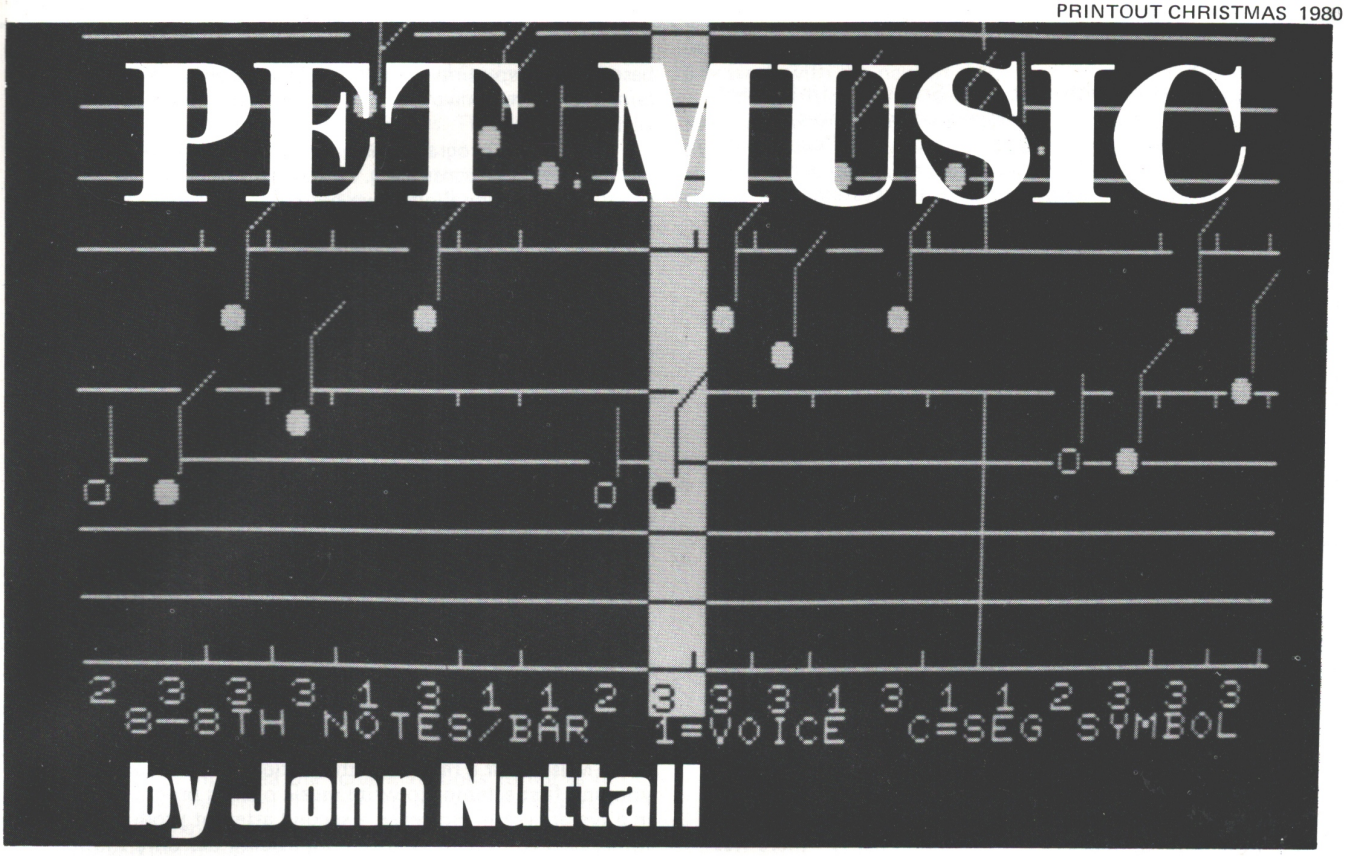


## PET MUSIC

"A day without wine is like a day without sunshine" ran the poster in a local pub. PET freaks might like to amend that to read: "A PET without sound is like a dog without a bark".

Why Commodore didn't add a small internal speaker to their machines still eludes me: the cost would have been minimal. Perhaps they don't like the idea of computers being used for games - but you and I know differently. Most games use sound, and if you don't yet subscribe to CURSOR, may I suggest that you take out a subscription, and see how well they use sound to enhance their programs. These games utilise the USER PORT although some use the cassette port. The former is the more popular and there are several sound boxes available (at awesome prices) which will turn the PET into a piano or an organ. Sound from the USER PORT is normally called CB2 and comes off pins M (signal) and N (ground) - be careful before you hitch anything to the port otherwise you'll have smoke effects as well as colour!

## HOW IT WORKS

CB2 makes use of the VIA chip (6522), which appears to the PET just like any other chunk of RAM, accepting and returning 8 bit binary. If you enter say, decimal 85 in location 59466 (POKE 59466,85), that location now contains 01010101. If you now poke 59467,16 that former location is shifted out serial fashion onto the CB2 line, which causes it to go high or low as "0" or "1" goes by. You can also change the pitch by POKEing another area: POKE 59464,X, where the bigger the "X", the lower the pitch.

Petsoft have a program that turns the PET into an organ, taking care of all the sharps and flats in the key signature. CURSOR's "MUSIC" will allow you to save your magnum opus to disk or cassette for recall to impress your family and friends. I'm sure there are lots more programs, but these represent a fair cross-section.

## A BETTER METHOD

However, the above programs have a serious limitation, in that you can only get the melody line out, or single bleeps and pips. If you had to listen to Mozart or Pink Floyd that way for too long, chances are that you would reach for the volume control. Now, there are at least two packages on the market which will allow 4 part harmony or chords to be played on the PET - and the price is very modest. One such package comes from A.B. Computers and the other comes from MTU (marketed in this country by IJJ Designs). In both cases the package consists of software to control the music output and hardware in the form of a digital to analog converter which will plug onto the USER PORT and CASSETTE PORT. Both programs produce the same quality of audio, but both systems have their own ways and means as we shall now see.

## VISIBLE MUSIC

First the A.B. Computer's package: this came direct from the States but is available here from Audiogenic Ltd. at £39.95 inc. VAT. The documentation was good and I had something like music coming out in less than fifteen minutes. Bach would have turned in his grave I think. The Visible Music Monitor came on cassette along with a charming "sample" of 4-part music. It was a real thrill. The D-A converter plugs onto the two ports and has extended edge connectors so you can still access both ports. It mounts vertically so no extra table space will be needed. There are three possible sound outlets from the board; D-A filtered, D-A unfiltered and line output at 0dB, 600 ohm. A phono socket is provided and a level control - this would drive a modest sized 4 ohm speaker directly.

Now the real beauty of this program is that it allows you to see the music as it plays - you can use the normal screen edit functions; cursor up will sharpen a note and cursor down will flatten it. It is simply amazing to see your composition playing as well as hearing it in four part harmony. You start composition by defining the four voices or registers. These can later be changed at will or added to. There is a passing reference to adding other waveforms, and readers with technical know-how will know about the new GI chip - AY3 8910. Next you state the key and the correct number of sharps or flats will spring on to both staves. The time signature can be changed as well, and the tempo. If all that sounds as if you need to have a doctorate in Music, I should point out that I don't have one!

*Continued on page 30*

*Continued from page 29*

**ODD NOISES**

Now you can get on with putting in Schubert's Unfinished Symphony. The keyboard is designated in octaves, but I found it easier and quicker to bash a note and "cursor" it into the right position. You can, if course, enter any value of note and rest. The only drawback of this system was that I kept forgetting to press the space bar to give me the next voice - if you omit this you have some very odd noises. Once the chord is correctly input, you press return and a small vertical line appears, and everything so enclosed will play as a chord. You need not bother about bar lines as all the counting is done by the Monitor. Simplicity itself!

One facility I have not tested with success is that you are able to use your cassette deck as a kind of autochanger; you could put the top twenty (a la PET) onto a C90 cassette and have the monitor call the first tune and play it, then call up the next and play that until it reaches the last tune. If this could work for disk, the PET "disko" might be great fun.

I have demonstrated this package to music teachers and they were as thrilled about it as I am. It is easy to use and is well-presented. The only adverse comment I can offer is that I noticed the screen display facility does tend to slow the music a fraction, but then you can opt for screen off - but that destroys most of the fun. This package and the M.T.U. one both make extensive use of machine code, and this means that they are both very fast and economical on memory. I have done extensive programming on both and never yet run out of memory.

**THE MTU SOUND**

The D-A boards are compatible with both monitors, although I found the M.T.U. board better in sound quality - there was more top end than on the A B Board. However, it fits horizontally and will need more table space. Extended edge connectors are provided and like the other board, there is a phono outlet oscket with volume control. I should add that both boards do exhibit a degree of "processor mush". The M.T.U. program comes with an extensive manual and is again cassette based, with two sample tunes: *76 Trombones* and *The Entertainer.* I did not have any documentation on the D-A converter.**

If the A B program was easy to use, this one I found tedious and time-consuming. So much so that I asked a friend to study the manual and give me his impressions. His comments mirrored mine - "You would need a week to write a verse of the National Anthem." Despite that big minus point, I think this package writes better music than the A B one.

After loading the M.T.U. monitor, you then have to do a SYS 1024 to get into the monitor. Song data and coded instructions are held in table form in locations 0F00-0FFF Hex. Now you will have to refer to the manual of the hex value of each note, as well as for rests and note values. The first step, however, is to define the number of voices and to assign the voices to waveforms, and this is done in location OA27 - OAF4 which is the location of the SEQNCR. This subroutine takes data at location OFOO and interprets it as a string of commands. If the first byte is equal to FF Hex, then subsequent bytes indicate special actions. For example, FF 01 V1 V2 V3 V4 = assign voices to waveforms, where V1 etc. are the page number of the voice tables to be assigned to voices 1 to 4.

**SILENT NIGHT**

The PLAY and MUSIC segments of this program are essentially identical to Hal Chamberlin's program described in BYTE (September 1977 - or see "The BYTE Book of Computer Music" for a reprint of that article.) To be honest with you, my first attempt to write music on this program resulted in a system crash. However, a second attempt produced somethink akin to "Silent Night" - that being the only music I had to hand. Having debugged the music further, I was then able to save the music to tape via the monitor. (Don't forget the end address must be the Hex end address + 1 .... something else the CBM manual never told you.)

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choice. Talking about money, the M.T.U. board and software will cost you £57.00. I have just phoned IJJ Design Ltd. to check this price and they inform me that there are two additional items in the pipeline from the States. The first is a program that will allow instrument synthesis. It is a serious limitation of both systems as they now stand that all the music sounds like computer music, even allowing for voice and waveform additions. The manufacturers claim that this M.T.U. package, when it is available, will overcome this defect. It should allow a reasonable approximation of any instrument, given the limitations of 8 bit resolution and the upper frequency cut off point. (At present, the cut off of both boards is in the region of 3.5KHz). The voice at the end of the phone was very enthusiastic about this new addition to the family and mentioned something about a "harpsichord" demonstration tape.

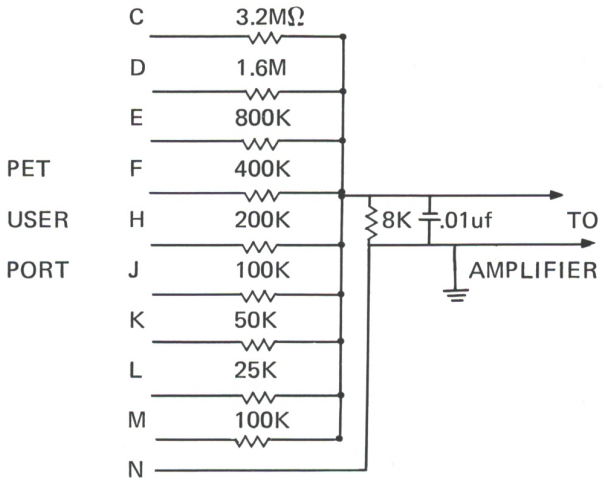
The other promised addition is what the Americans call the "human interface", which should make music data input less frustrating and less demanding on the inputter. It will give a visual output on the screen too - making use of the M.T.U. High Resolution board. That should be worth waiting for, but it will set you back a good sum.

**WHICH IS BEST?**

It's the old question of buying something now and then discovering that there's something newer and better on the market. At the present state of play, both companies are offering the same kind of sounds - one has visuals and the other has not. One requires you to program in Hex, the other will permit direct input via the screen. It looks to me as if the A B system wins when it comes to writing the music, but the M.T.U. may be the final winner when it comes to versatility and useful additional bits and pieces. I suppose it all comes down to what you want the program for.

Both sources have made a valuable contribution to furthering the uses of the PET. I have a feeling that there's more to come. If anyone is doing anything in the music line on a PET, I would like to hear from them. I would especially be interested in hearing from anyone who has done any work with the new GI chip.

Meanwhile, for anyone who wants to experiment with more complex sound on the PET, I enclose a poor-man's digitial to analog converter, which should at least get you started. It's nothing very special, but you should use precision resistors:-




Circuit diagram from original by Jim Butterfield

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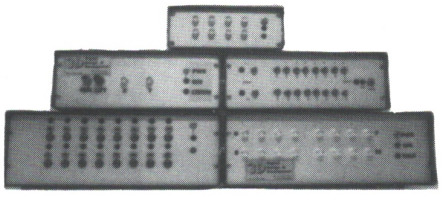

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**CREATE** KC$="CREATE O:MAILFILE,120,15,1: SYS 24576 This example tells KRAM to create an indexed file called MAILFILE on the disk in drive zero, with a record length of 120 characters and a key length of 20 characters which starts at position 1 of the record. KRAM looks at the RESERVED variable KC$ to identify the function and its parameters; the SYS call tells KRAM to execute the function. The record length can be any value up to 254 characters and the key up to 48 characters, a total of 302. KRAM packs as many records into the 255 character disk block as necessary.

**OPEN** KC$="OPEN O:MAILFILE": SYS 24579 This tells KRAM that we will want to make accesses to the file called MAILFILE on the disk in drive zero. KRAM returns in location zero (peek (0)) the file number by which this file can be accessed during the rest of the program.

**ADD** KC$="ADD 1,NA$,AD$": SYS 24591 This tells KRAM to add to file number one the data in variable AD$ whose key is NA$. For example in a mailing list, the key NA$ might be the name 'SMITH A.J.' and AD$ might be the address '120, HIGH STREET, ANYTOWN'. Any normal double character string variable can be used to denote the key and the record.

**GET** KC$="GET 1,NA$,AD$": SYS 24582 This tells KRAM to get from file number one the data belonging to the key NA$ and put it into variable AD$. In our example, if NA$ was 'SMITH A. J.', KRAM would read the address '120, HIGH STREET, ANYTOWN' from file and put it into variable AD$. If we weren't sure of the exact surname, we could give KRAM the key 'SM' and it would get for us the next alphabetically higher name beginning 'SM', together with its address! Or if we gave KRAM a blank key, it would find the first name and address on file.

**READ** KC$="READ 1,NA$,AD$": SYS 24585 This tells KRAM to read the data belonging to the next highest key following the name in NA$, and put it into variable AD$. In our example, a complete file of names and addresses could be read in alphabetical order, starting at any name in the file, simply by executing successive READ commands! For instance, having got Mr A. J. Smith from file, executing the READ command as above would get us say 'SMITH M.' in NA$ together with his address in AD$.

**READ –** KC$="READ-1,NA$,AD$": SYS 24585 This works like READ except BACKWARDS! It tells KRAM to read the data belonging to the next lowest key preceding the name in NA$, and put it into AD$. For instance, having read 'SMITH M.' with the forward read, executing the backward read as above would get us 'SMITH A.J.' in NA$ together with his address in AD$.

**PUT** KC$="PUT 1,NA$,AD$": SYS 24588 This tells KRAM to rewrite to file number one the data in variable AD$ which belongs to key NA$. For instance, if we wanted to change Mr A.J. Smith's address, we would simply set NA$ equal to 'SMITH A.J.', AD$ equal to his new address, and execute the PUT function.

**DELETE** KC$="DELETE 1,NA$,AD$": SYS 24594 This tells KRAM to delete from file number one the key contained in NA$ and its associated data contained in AD$. In our example, to delete Mr A. J. Smith from the file, we would simply set NA$ equal to 'SMITH A.J.', AD$ equal to his address, and execute the DELETE function. KRAM will release for further use the disk space made available by the deletion.

**CLOSE** KC$="CLOSE 1": SYS 24597 This tells KRAM that file one is finished with for now. KRAM updates the BAM on disk, but the file can still be used without another OPEN command.

**INITIALIZE** SYS 24600 This function is used at the beginning of each program to clear KRAM's work areas and buffers.

The examples above illustrate the use of KRAM in a mailing list application, with disk access times from less than one second. KRAM can of course be used in any application program with the Commodore disk where programmer time, user time and disk space are at a premium.

Each KRAM package includes a ROM which plugs into the middle ROM socket of the 16K/32K Pet, a demonstration disk with a mailing list program and a 40-page User Reference Manual. KRAM is available by post (cash with order) price £115 including VAT, or by credit card phone the KRAM 24 Hour Order Desk on 01-546 7256; or see your nearest dealer. (Quantity discounts available).

# Calco Software

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**Is it possible to run a Mailing List program without disk drives? The conventional wisdom and PET Basic says that you can't. Here Julian Allason suggests a method of beating the system.**

The simplest - and to my mind the most effective means of storing data is within a program. If you are the proud owner of a shiny new disk drive, then data storage is a (relatively) straightforward business. Tape is a different matter; PET cassette files are slow, unreliable and bothersome.

So here is an alternative that is simple and effective. We are going to store and retrieve data from within the program, using DATA statements in a novel way.

The drawback to using DATA statements has been that you cannot change them while the program is running. This is fine if you simply want to read back and print out information; it becomes rather more of a limitation when you want - as you almost certainly will - to enter new data while the program is running. PET Basic simply won't allow it.

My solution is stop and restart the program so quickly the user barely notices. That means automatically. Suppose you wanted to add a name and address to your mailing list. Call up the menu and select E for Enter Data. The next stage is to store the data as a variable in RAM using an INPUT statement:

```
100 INPUT "Enter Name and Address"; NAME$
```

Your reply is stored in the string variable NAME$. Unfortunately, SAVE in PET Basic (but not in certain others, like Sinclair ZX-80 Basic) saves only the program lines, not the variables. One answer to this problem which avoids the use of data tapes is to print on screen the new line number and the word DATA, followed by the input string, and then press Return:

```
100 PRINT L + 10; "DATA"; NAME$
```

We would first have to stop the program, move the cursor back over the line, press Return, then restart the program; a tedious business.

I spent several fruitless hours trying to POKE Return directly in an attempt to automate this procedure. However, we can use one of PET's anomalies to achieve the same end.

You may have noticed that if you press a key while PET is busy performing some important task such as LOADing, the character suddenly appears on screen once that operation is completed. This is because all keystrokes are temporarily

stored in the keyboard buffer, which can hold the values of up to ten characters, in locations 623 to 632 of the revised ROM set. (The original ROM set uses locations 527 onwards). Location 158 (525 old ROMs) stores the number of key-strokes held in the keyboard buffer.

By POKEing a 13, the code for Return, into location 623 we can cause a Return to be executed automatically.

```
100 PRINT "cls cd cd
110 PRINT "RUN
120 POKE 158,1: POKE 623,13: ?"ch":END
```

would store a return in the keyboard buffer that will cause the RUN printed on screen to be executed.

This technique can be used to restore the values of variables lost when the RUN command is executed:

```
100 PRINT "cls cd cd
110 PRINT "A = "; A
120 PRINT "NAME$ ="; NAME$
130 POKE 158,2: POKE 623,13: POKE 624,13: ? "ch":
    END
```

or to add new lines to the program:

```
290 PRINT "cls cd cd
300 PRINT L; "DATA"; NAME$
310 PRINT "GOTO 150
320 POKE 158,2: POKE 623,13: POKE 624,13: ?"ch":
    END
```

This will add a new line number, L, with a DATA statement containing the Input string, NAME$. The second Return will execute the GOTO.

This technique is the basis of the following simple mailing program. Names and addresses are easily added and by re-SAVEing the program, all new information added will be saved also.

A menu offers the choice of Entering a name and address, Printing out a full list on a printer, Terminating the program, Saving it, or Listing all the data on screen.

This particular program was written to handle subscriptions to a club or magazine; provision has therefore been made for a coding to be included as the last section of each data item. Pressing E to Enter Data prints instructions on the screen, together with flashing chequered cursor. Pressing Return without entering data sends you back to the menu.

Since commas terminate an input string, slash symbols have been used as delimiters instead, e.g.:

```
ENTER NAME & ADDRESS
? JULIAN ALLASON/PRINTOUT/PO BOX 48/NEWBURY
```

When P is selected to Print out the full mailing list a short routine at lines 750-800 reads each character in the string, converting them into substrings corresponding to a single line of printed output:

```
JULIAN ALLASON
PRINTOUT
PO BOX 48
NEWBURY
```

The slashes serve as flags to indicate the end of each substring and are not printed out.

The number of the last DATA line entered is stored as the variable L in line 100. This line is automatically incremented each time a new DATA line is added to the program. Three slash symbols, stored in the data statement in line 63999 are used to flag the end of DATA.

Pressing T to Terminate the program causes the last input string, F$, to be checked. If new Data has been entered since the program was loaded F$ will contain the chequer character (needed to return to the menu after entering data). If no new names and addresses have been entered, i.e. the recording on tape is still current, the program will END. If new lines have been added, the program will jump to the special SAVE routine.

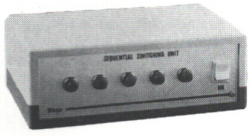
Pressing S to SAVE the program causes the screen to print:

```
"REWIND A NEW TAPE THEN PRESS ANY KEY"
100 L = (whatever last line number was)
SAVE "NEW MAILING LIST"
```

The keyboard buffer is once again POKEd with Returns to amend line 100 and SAVE the new program.

```
10 REM BASIC MAILER 7.0   13/9/80
20 REM
30 REM  A SIMPLE MAILING LIST PROGRAM
40 REM  WRITTEN & PLACED IN THE PUBLIC
50 REM  DOMAIN BY JULIAN ALLASON
60 REM  PRINTOUT,  PO BOX 48, NEWBURY.
70 REM
80 REM
90 G=0:REM INITIALIZE ARRAY DIMENSIONER FLAG
100 L= 2000
110 REM  L=NO OF LAST DATA LINE
120 GOTO410
130 REM** DATA ENTRY **
140 PRINT"■■■■■■■■■■■■ ┌──────────────────────────────────────┐"
150 PRINT" │PLEASE ENTER THE SURNAME FOLLOWED BY │"
160 PRINT" │                                      │"
170 PRINT" │THE SLASH SYMBOL,"CHR$(34)"/"CHR$(34)", THEN CHRISTIAN │"
180 PRINT" │                                      │"
190 PRINT" │NAME, EACH ADDRESS LINE & LAST ISSUE  │"
200 PRINT" │                                      │"
210 PRINT" │OF SUBSCRIPTION WITH SLASHES BETWEEN │"
220 PRINT" │                                      │"
230 PRINT" │EG: ■SMITH/JOHN/12 DUNN RD/READING/20■ │"
240 PRINT" │                                      │"
250 PRINT" │PRESS ■RETURN■ TO GO BACK TO MAIN MENU │"
260 PRINT" └──────────────────────────────────────┘"
270 REM
280 REM
290 REM
300 PRINT"■■ENTER NAME, ADDRESS, TERMINATION ISSUE■
310 INPUT"■■■■";F$
320 IF F$="■"THEN410
330 PRINT"■■■"
340 PRINTL;"DATA";F$
350 PRINT"100 L="L+10
360 PRINT"GOTO140
365 IFPEEK(50500)=0THENPOKE525,3:POKE527,13:POKE528,13:POKE529,13:PRINT"■" END
370 POKE158,3:POKE623,13:POKE624,13:POKE625,13:PRINT"■":END
380 REM
390 REM
400 REM
410 REM*** MAIN MENU ***
420 PRINT"■■■■■■■■■■■■
```

# Wego Computers Ltd



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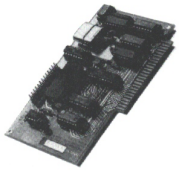

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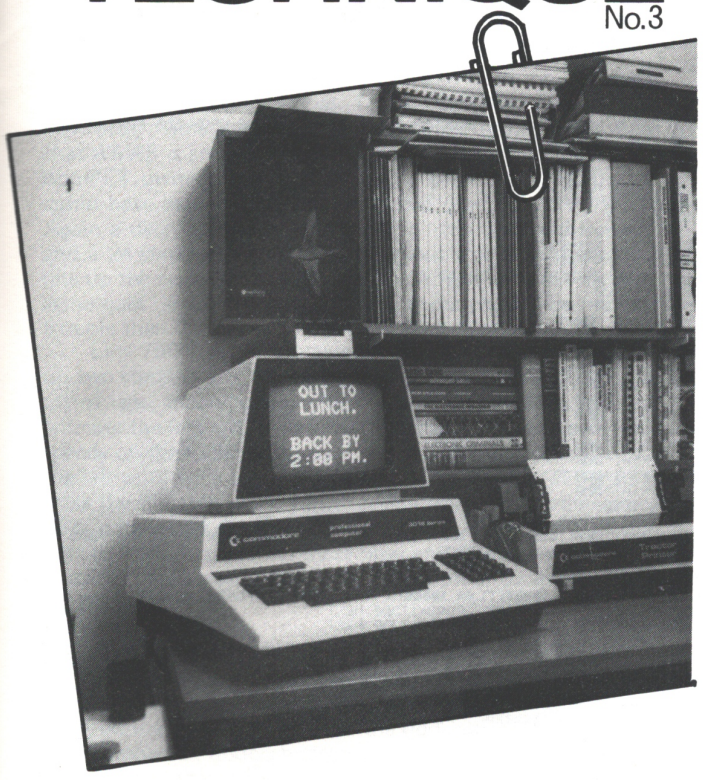


# ANIMATED GRAPHICS

**Lindsay Doyle** *(pictured above)* **tells you how to animate your PET.**

## INTRODUCTION

In the last installment we covered some of the fundamentals of how to position things on the screen and move them about. This month we will take up animations; that is, picture elements which not only move about the screen but also show simulated activity. As I'm sure you realize, the effect of motion and activity depends on the phenomenon of persistence of vision to carry the mind from one non-moving image to another. We can't jump too far on the screen on each step for fear of destroying the illusion, so it's best to limit motions to the eight directions, horizontal, vertical and diagonal, and not to attempt directions like "over two and up one", at least initially. I'm speaking, of course, of the abilities of the standard PET. Hardware which allows any 8 by 8 pattern to be written in any pixel is now on the market, and with this we can advance to moving our graphics one dot in any direction rather than one whole pixel. The complexities of this departure are a bit too advanced for the present discussion, though, and I will refrain from considering them until the last article in this series, at which time I hope to have a working billiards game programmed.

## CARTOON CHARACTERS

As Walt Disney discovered, simulating activity such as walking or flying is very difficult to do if absolutely true copies of the real thing are required. However, the mind of the viewer turns out to be easily satisfied with simple approximations. Look at a cartoon character on the telly and note that it has few, if any, joints in its limbs and that, when it moves, its legs either are hidden or else go through only the roughest approximation of true motion. We can use the same approach, and we can also borrow from the Silly Symphonies the techniques of exaggerating speed and punctuating movement with audio effects. (I assume that all my readers have audio or at least understand what is required and are planning to install it! If you don't, let me advise you that you are missing a great deal of fun and satisfaction. Programs which contain audio effects should be identified by an exclamation mark appended to their titles, a practice initiated I believe by Cursor, the tape cassette magazine.)

## SOME WUMPUS ANIMATIONS

The game of WUMPUS, for any of you who haven't been exposed to it, is a classic in which a set of caves interconnected by passages is generated by the computer and various hazards are randomly placed in certain caves. One never sees these hazards: the computer advises the player when one is nearby. Let us correct this situation by generating a couple of animations, one for the Wumpus and one for the Superbat. As there are various schools of thought on the appearance of a Wumpus, and as no one has ever survived seeing one face to face, if in fact "face" is the proper word in this context, I shall assume that the Wumpus is a spidery sort of beast that is capable of climbing a web and running upside down on the ceiling of a cave. As for the Superbat, I visualize it as having giant leathery wings and not much else. License is hereby granted to any objectors to make their own changes and improvements.

I hope that exposure to some of these ideas will motivate you to try out your own, so why don't we structure a menu-type program to which we can append a whole series of special effects from time to time and which can be used to call any of them up for review? Figure 1 is the block diagram of an expandable menu program for this purpose. If you record it on tape, you should give it its own cassette or make it the last program on the tape so that there will be plenty of expansion space for the future. The listing at the end of this article includes this structure, with the Wumpus and Superbat animations which we will now develop, plus a non-animated map of the Wumpus' cave.

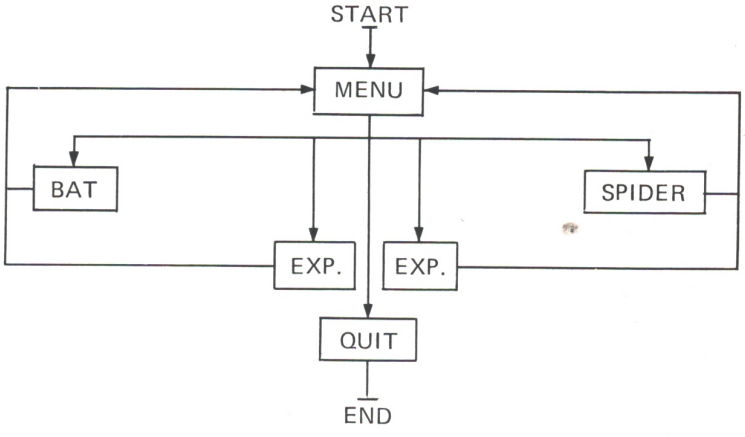


Figure 1: Block Diagram of 'Special Effects' Menu Program

## THE SUPERBAT

The first thing to do is to get out the old screen layout graph and decide where the bat shall appear and the direction it is to take. I have arbitrarily chosen to let it arrive in the upper left and descend on the diagonal, 24 lines to the bottom of the screen (line 520). As it is desirable to be able to experiment easily with the speed of motion, I have set up a variable DE for this purpose and given it the value of 75 (line 520). You can change it to suit your own taste. It is used in a

*Continued on page 36*

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*Continued from page 35*

series of otherwise functionless FOR–NEXT loops as a delay-timing device to control the length of time each elementary picture is held on the screen.

To write lines like these which are much the same as each other, write the first line and press RETURN; then overwrite it with the line number of the second line and press RETURN, and continue in this way to make as many duplicates as desired. Then re-LIST the program on the screen and go down the list modifying each line to the form required. It's a lot faster and saves many hours of life of the old-type rub-away key tops.

```
100 REM:'SPECIAL EFFECTS' BY L.DOYLE 8/80.
110 REM:A MENU-OPERATED PROGRAM TO DISPLAY VARIOUS GRAPHICS SUBROUTINES.
200 PRINT"□PRESS INITIAL LETTER TO SELECT DESIRED
210 PRINT"■EFFECT. PRESS '0' TO QUIT PROGRAM.
220 PRINT"■■■■AT
230 PRINT"■■■PIDER
240 PRINT"■■■AP
400 GET X$
410 IFX$="B"THEN500
420 IFX$="S"THEN700
430 IFX$="M"THEN900
440 IFX$="0"THENPRINT"□":END
450 GOTO400
500 REM:'BAT ANIMATION' SUBR. BY L.DOYLE 7/79.
510 PRINT"□■■■";
520 DE=75:FORJ=1TO24
530 PRINT"■■■■ ▗▄▖";:FORD=1TODE:NEXT
540 PRINT"■■■▚▄▞";:FORD=1TODE:NEXT
550 PRINT"■■■▗▄▖";:FORD=1TODE:NEXT
560 PRINT"■■■■   ■■■■▗▄▖";:FORD=1TODE:NEXT
570 PRINT"■■■■▛▀▜";:FORD=1TODE:NEXT
580 PRINT"■■■■(▀)";:FORD=1TODE:NEXT
590 PRINT"■■■■▛▀▜";:FORD=1TODE:NEXT
600 PRINT"■■■▗▄▖";:FORD=1TODE:NEXT
610 PRINT"■■■▛▀▜";:FORD=1TODE:NEXT
620 PRINT"■■■■   ■■■▚▄▞";:FORD=1TODE:NEXTD,J
630 GOTO200
700 REM:'SPIDER ANIMATION' SUBR. BY L.DOYLE 7/79.
710 W$="::■■■::■■■::■■■::■■■::■■■::■■■::■■■::■■■::■■■::■■■::■■■
720 PRINT"□"SPC(20)W$W$"■■■";
730 DE=150
740 FORJ=1TO24
750 PRINT"      ■■■■■■▛▜▗●●▖■■■■■■▚((++))■■■■■■■";:FORD=1TODE:NEXT
760 PRINT"▛▜++▛▜■■■■■■■";:FORD=1TODE:NEXT
770 PRINT"▗▖++▚▞■■■■■■■";:FORD=1TODE:NEXT
780 NEXTJ
790 DE=75
800 FORK=1TO18
810 PRINT"▝●●▘ ■■■■■■■▚((++)) ■■■■■■■";:FORD=1TODE:NEXT
820 PRINT"▙▟++▙▟■■■■■■■";:FORD=1TODE:NEXT
830 PRINT"▚▞++▗▖■■■■■■■";:FORD=1TODE:NEXT
840 NEXTK:PRINT"■       ■■      "
850 GOTO200
900 REM:'MAP OF THE CAVES' SUBR. BY L.DOYLE 9/78.
910 PRINT"□■                                                    "
920 PRINT"■          17      18                                 "
930 PRINT"■           ┌┐      ┌┐                                "
940 PRINT"■      ┌────┘└──────┘└──┐                             "
950 PRINT"■      │  6    7│  8    9│   10  │ THE CAVES          "
960 PRINT"■      │ ┌┐    ┌┐    ┌┐    ┌┐  │   OF THE           "
970 PRINT"■      │ └┘    └┘    └┘    └┘  │   WUMPUS           "
980 PRINT"■      │   ┌┐    ┌┐    ┌┐    │                      "
990 PRINT"■      │   │└┐  5 │  1 │  2 ┌┘ │   │                "
1000 PRINT"■     │   │  └┐  └┐  └┐  └┐  │   │                "
1010 PRINT"■ 16  │ 15└──┐ └──┐ └──┐ └──┘ 11  │ 19             "
1020 PRINT"■     │ ┌┐   │    │    │    ┌┐   │                "
1030 PRINT"■     └─┘└┐  │    │    │   ┌┘└─┘                 "
1040 PRINT"■      │  └┐ │    │    │   ┌┘  │                  "
1050 PRINT"■      │   │ └┐   └┐   └┐  │   │                  "
1060 PRINT"■      │   │  └─4   └─3  └──┘   │                  "
1070 PRINT"■      │   └┐          ┌┘       │                  "
1080 PRINT"■      │    └┐  ┌┐    ┌┘        │                  "
1090 PRINT"■      │     └──┘└────┘         │                  "
1130 PRINT"■                20              "
1140 PRINT"■    PRESS 'SPACE' TO RETURN                        "
1150 PRINT"■                                                   "
1160 WAIT 59410,4,4:PRINT"□":GOTO200
```

### WINGS

Examination of lines 530-620 will show the series of symbols which I have chosen to represent the moving wings of the bat. Don't knock it till you've tried it! Each line begins with three cursor lefts to set the cursor back to where it can overwrite the previous picture with a new one. Line 530 includes a space to move the bat one step to the right each time it is used.

In the following lines, the body of the bat is reprinted in the same place each time while the wings are shown in a new position, repeating until line 560, where the entire picture is erased with a series of three spaces and we step down one line. Note that the body is now at the top of the pixel: this makes it appear to have only moved down by a small amount from the bottom of the line above, and allows us to use the rest of the symbols which are attached at the top rather than the bottom, if you see what I mean.

The under-body wing sweep continues until the wings return to their horizontal position, again at line 610. As the wings rise further than this, it is natural to expect that the body of the beast will drop a bit, so we let this happen in line

620, and are now ready to repeat the cycle from 530 again. Note that the image moves across the screen under the effect of the incremental cursor strings, and no other positioning is required. I'll leave it to you to populate your screen with a whole flock of bats, all flying in different directions!

### THE WUMPUS (SPIDER TYPE)

Returning to the screen layout sheet we might decide that the Wumpus shall appear on a vertical web in the middle of the screen, climb up the web, and finally run across the top of the screen upside-down. Lines 710 and 720 clear the screen and print the web. The effect of drops of water on a spider web is surprisingly evocative. Two cursor lefts and a cursor down each time puts us on the line directly below. Notice that W$W$ is an acceptable abbreviation in a print statement: non-PET owners may not be able to get away with this. (I could have made W$ half as long and used W$W$W$W$.) Again a delay constant is selected, a little slower this time, and a 24-step loop carries the Wumpus from the bottom line up the centre of the screen. We allow him to eat his web as he goes, as his passage erases it, and it would be more trouble than it's worth to redraw it each time.

Line 750 erases the previous set of legs, moves the cursor up two steps, draws the body, drops down and draws the first set of legs, and repositions the cursor. Lines 760 and 770 animate the legs. When he reaches the top of the screen, he speeds up (line 790), rolls over, and proceeds to scamper to the left until he is terminated in line 840 which is designed to erase the Wumpus only, while leaving any text or other pictures untouched. By this time you are no doubt fully competent to read the action in these lines and to make your own Wumpus race across in the other direction or disappear behind a stalactite.

### THE MAP OF THE CAVES

As I am restricted to 2,000 words on pain of death, I won't go any further into motion simulation at this time but will give you my idea of the map of the dodecahedronal Caves of the Wumpus. A dodecahedron is a three-dimensional figure with twelve faces. The caves are at the twenty vertices and the tunnels run along the edges. All the faces are pentagons. To represent this in two dimensions, one can use a perspective drawing or one can distort the dimensions of the sides, compressing some and expanding others until they appear on a plane surface without any crossovers.

The elegant way to do this is with nested pentagons. I have chosen a topologically equivalent alternative which, while not quite so elegant, is more compatible with PET's graphics limitations. The map is not, incidentally, a tool for the experienced Wumpus player; it should be reserved for the use of beginners and the younger generation. You can insert it into your program as a third option at each turn: move, shoot, or have a look at the map. In my version, the player is only allowed a limited number of looks: after that the map is stolen by a Superbat.

### REVERSE SCREENS AGAIN

The map is printed in reverse: i.e. the lines and characters appear as dark on a light background. One can cover the screen with reverse-field lines as I have done here, or one can descend into machine language and instantaneously reverse the entire screen. The latter is a process which we will be discussing in a future article along with other machine-language graphics magic that the PET world has access to, thanks to Warren Swan of Oak Forrest, Illinois, USA. An entire page of reversed text is much easier to read, and reversed drawings such as maps, block diagrams, graphs, and the like are more effective. This is largely because the dark lines are thinner due to the fact that the dots "bloom" or expand slightly beyond the theoretical area which they should occupy. As I have stated before, reversed text should never be used without a suitable frame to set it off. If the whole screen is reversed, this serves the purpose very well, but you will find that blocks or frames constructed from the shifted-equal-sign family have an even more effective appearance when used in reverse.

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# BOOKS

## SMALL BUSINESS PROGRAMS

| | | |
|---|---|---|
| **Author** | : | **S. Roberts** |
| **Publishers** | : | **Elcomp Publising Inc., California U.S.A.** |
| **Suppliers** | : | **Computer Bookshop, 43 New Street, Birmingham B2** |
| **Pages** | : | **120** |

First the good news: this is a paperback containing 117 numbered pages, 3 unnumbered pages of text, and 8 blank pages. It has a contents page but no index. A catalogue of the other products of the Elcomp Company is printed inside the back cover. The author is very good at "I before E except after C".

Now the bad news: the first spelling error appears on the cover, but it is not allowed to be lonesome. (A prize to the first respondent to use all the following words in one meaningful sentence: "depleat", "enterprize", "acurate", "querries", "enterpreneur", "chasis", "unterneath", "achor", "arount", "pilar", and "monthy".) The book was printed in West Germany and the copyright is held by a German firm. In retrospect I see a decided Germanic flavour to some of the spelling errors, which suggest that the book may be a translation. (No excuse, however!) The text (21 pp) is a jumbled hodgepodge of subjects which appears to have been scissored from one or more articles and pasted together without fear or planning.

Taken as a whole as advice to the small businessman contemplating purchase of a micro, the various recommendations are probably harmless: diskettes are desirable; you don't need 16 bits; an S-100 bus design gives you a wide selection of special-purpose modules. But the logic used to arrive at these conclusions is often questionable, if not reprehensible. Take, for example, the argument that a modular system is better than an "all-in-one" system because in case of malfunction, the offending module can be removed and repaired while a "loner" (sic) replacement is substituted. If the computer (and remember, we are talking about micros) isn't screwed down, surely the dealer who is prepared to provide a "loner" module can instead provide a "loaner" computer!

Scanning the programs included (there are 32 of them, although the Table of Contents would lead you to believe that there are 38), we find all the hoary old chestnuts: cheque book and savings accounts (three versions); decimal alignment (four, some under misleading titles like OUTPUT FORMATTING); mailing list (cassette based); MIN, MAX, AVG; day of the week and day interval between two dates; conversion from calories to "joul" (sic), KP (whatever they are) to Newtons, and the like, useful around the modern office; a sort of word-processor; and, oh yes! the rare and much-sought-after hex to decimal conversion (one-way only). The Preface states that the programs will run on any BASIC computer: it lies. Many of them use PEEK and POKE addresses specific to a given computer. None use any graphic symbols, and the accursed scroll-up is omnipresent.

Binary recommendation: thumbs down!

L.D.

## LIBRARY OF PET SUBROUTINES

| | | |
|---|---|---|
| **Author** | : | **Nick Hampshire** |
| **Publishers** | : | **Computabits Ltd.** |
| **Suppliers** | : | **Computabits Ltd., P.O. Box 13 Yeovil, Somerset** |
| **Pages** | : | **141** |
| **Page size** | : | **8.25 ins by 11.5 ins** |
| **Price** | : | **£10.00** |

In our opinion Nick Hampshire may have done himself a significant disservice by titling his latest book "Library of PET Subroutines" for, as a title, it gives a damagingly imperfect idea of what it contains.

Before we received our review copy, we'd already concluded that it was likely to be a bound collection of the various subroutines we all knew about, but often had some trouble locating - especially at the time we needed them. It was therefore (we thought) likely to be useful, because it would at least gather together in one place quite a lot of material for which we'd found ourselves irritatedly searching on previous occasions.

We couldn't have been more wrong, and if that's what you were thinking, then you were wrong too.

The book might have more properly been titled "All You Ever Wanted To Know About Handling Databases On PET But Didn't Know How To Ask Plus A Lot Of Other Rather Clever Stuff" – except that would have been rather long and unwieldy. It would have been a darn sight more explanatory though, and might have meant that those who'd otherwise pass up this excellent volume then would not.

Because the book is good and, in our view, should be on every PET-owners reference shelf - except it's so useable it's hardly likely to stay there.

Don't let us mislead you, however. You won't find anythink startlingly new or revolutionary in its 141 pages. What you will find is a vast storehouse of immediately useable programs, since listings are the main content. And, let us note in passing, excellently reproduced they are too. Those who've spent unhappy and headache-ridden hours squinting at listings in other books need have no fear with this one.

The linking theme in virtually all the programs reproduced in the book is their possible use in one database form or another. But this does not prohibit their use in other types of program, serving other purposes, and doubtless there will be many who will find the book's main value to lie thus.

We'd recommend it for one thing alone, if the truth be told, and that's Mr. Hampshire's lucid and helpful 12 page "introduction". We suspect it was meant to be one or two pages only, and the author got carried away, but that's not a criticism. If you've ever wondered wistfully where you could find out more about data handling - the one thing computers do best - look no further. It's all here.

We have only one criticism. For no apparent reason, the book totally lacks contents pages. It's an extraordinary omission, and we don't understand it. If you plan to browse through the book before buying therefore, turn to the index. It's the nearest thing to contents there is.

And in case you haven't yet got our message yet, we like the book very much and thoroughly recommend it.

Footnote: every program listed in the book is available ready-to-use on one diskette from the publishers for a further £10.00. That sounds to us like another bargain.

T.H.

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# PEEKS & POKES

by Inside Trader

PET dealers have banded themselves together in a dealer association to protect against further atrocities by. Keith Hall and his Commodore "Sales" team. First action of the newly formed association was to put a contract out on Kit Spencer. In next to no time the Commodore boss was seen sprawling on the floor of the Skyway Hotel, Slough, felled by a powerful blow to the nose. Spencer, for reasons best known to himself, was wearing a monkey mask at the time.

There is no CP/M version of the top-selling PET program, VisiCalc. Or is there ? Dealers have been offered a program called 'Report Writer' by an outfit called Carolina Business Systems Inc. It seems somehow familiar. Personal Software, publishers of VisiCalc, are said to be unamused.

Out of the Mouths of Babes and Innocents Dept.: A reader has been kind enough to send me a letter he received from the Manageress of the Commodore Information Centre. It states: "The function of the Information Centre is not to give information."

Those attending the Commodore dealer conference were invited to test Medicom's medical history-taking program. Sample question: "Is there anyone you know who makes you want to open your bowels ?" I am sorry to say that the replies were preserved on disk.

Commodore came close to losing it's top management when the PET Jet caught fire at 20,000 feet recently. Aboard were President Jack Tramiel and Executive Vice-President, Dick Sanford. Despite failure of the electrical power, the pilot managed to land safely.

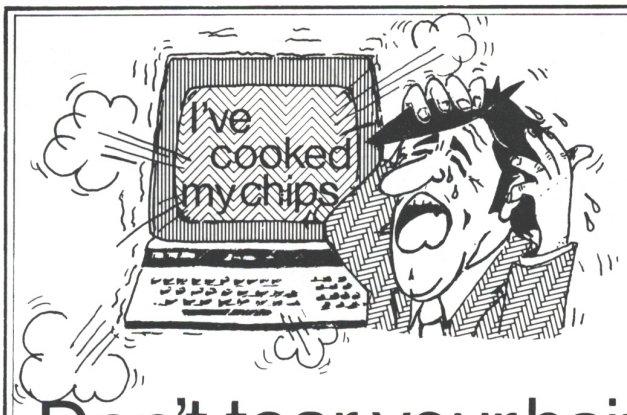
Coming soon (but not from Commodore): a twenty megabyte 14" Winchester hard disk for the PET. The software, written by GMS in Nice, offers ten key index sequential access. Nice!

The management of the Cunard Hotel, venue of the Personal Computer World Show, were not best pleased to find a lorry parked in the middle of the first floor ballroom. Needless to say it belonged to Chris Carey's Comp Shop. They still haven't worked out how he got it up there.

The complaint most frequently aired about the Atari is that it lacks applications software. So the manufacturers must be doing everything to encourage independent software producers. Right? Wrong! Atari recently filed suit against a company called Activision who are offering four games cartridges — for twenty *million* dollars!

The traditional mistrust of the America's conservative East Coast for the brash new West is being reinforced in the microcomputer industry by a growing vendetta between two leading magazines. On the one hand is the Silicon Valley based 'InfoWorld' (formerly the Intelligent Machines Journal). On the other, Kilobaud Microcomputing published in New Hampshire by the controversial Wayne Greene. At one stage InfoWorld were running a column entitled "Wayne-Watch" written by Greene's arch-foe, Jim Warren. The Kilobaud editorial pages duly thundered in reply. Relations are not expected to improve following the defection to InfoWorld of Greene's right hand man.

Young Martin Maynard of Audiogenics - they manufacture Commodore's software - had his ear (and lapels) bent by our leading importer of computer books recently. Stop undercutting or be sued was the message. This same importer labels his wastebins "Complaints".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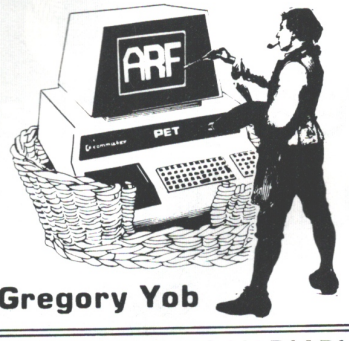


by Gregory Yob

## HOW BASIC STORES VARIABLES

Figure 1 shows how a BASIC program is arranged in the PET's memory. Starting at location 1024, the BASIC program's text is saved. The simple variables are stored immediately after the program - things like A$, B, or C% go there. After the simple variables are the compound (or array) variables - A$(), B(), C%().

After the variables comes the empty space and the strings are stored at the top (we're going up in memory). (The simple variable S$ has two parts - the simple variable storage area points to the string which lives at the top of memory.) As variables and strings are created in the RUN of a BASIC program, they move towards each other - and if they meet, you see an ?OUT OF MEMORY ERROR.

When a BASIC program is RUN, the space above the program text is empty. As variables appear, they are put into the simple or compound storage areas in the order of appearance (which might not be the order in the BASIC text due to GOTO or GOSUBs). If an array is declared and a new simple variable is needed, guess what? The entire arrays area is moved up a little bit in memory to make room for the new variable.

THE PET'S MEMORY AS SEEN BY BASIC

1024

| |
|---|
| Program Text (BASIC Statements) |
| Simple Variables (Floating Point, Integers & String Names) |
| Compound Variables (Arrays for Floating Point & Integers, String Array Pointers) |
| Free Storage |
| Strings Storage |

8191

Figure 1

## Looking at Simple Variables

As strings appear, they are put in the top, moving downward. If the strings space hits the arrays space a "garbage collection" is performed to remove any discarded strings. (For example, A$ = "HELLO" and later, A$ = "THERE" will leave HELLO as discarded, and the garbage collection finds and removes this "garbage".)

When a program ends, all the variables are still left in place, which makes life simpler for us programmers. However, if you change the BASIC text, or even make the PET think you changed a line, there is the chance that the new text is larger than the old one and all the variables would have to be moved. The PET isn't that smart, and takes the simpler approach which is to remove all the variables.

(NOTE: The variables are still in the PET's memory, but the PET no longer knows how to find them. When I get to describing pointers, this will be covered in some more detail.)

Figure 2 indicates the way the PET saves its simple variables. Each variable takes a block of 7 bytes, with the first two bytes storing the variable's name and type, and the remaining 5 bytes holding the variable's value (or a pointer in the case of strings). Let's use PEEK and see how these appear to us mortals.

Enter the following, exactly.

```
NEW
READY.
XX=0
READY.
FORJ=1024TO1040:?J;PEEK
(J)" lft sp sp sp sp": NEXT
 1024  0
 1025  0
 1026  0
 1027  36
 1028  88
 1029  88
 1030  0
 1031  0
 1032  0
 1033  0
 1034  0
 1035  74
 1036  0
 1037  139
 1038  1
 1039  224
 1040  0
READY.
```

STORAGE OF SIMPLE VARIABLES IN THE PET

| | Integer | Floating Point | String |
|---|---|---|---|
| Byte 1 | First Character + 128 | First Character | First Character |
| Byte 2 | Second Character + 128 or 128 | Second Character or ø | Second Character + 128 or 128 |
| Byte 3 | High Byte, 2's Complement | Binary Exponent + 128 or ø | Number of Characters |
| Byte 4 | Low Byte, 2's Complement | Signed Binary Mantissa, MSB | Lo Pointer Byte |
| Byte 5 | ø | Mantissa | Hi Pointer Byte |
| Byte 6 | ø | Mantissa | ø |
| Byte 7 | ø | Mantissa, LSB | ø |

Figure 2

Let's decipher all this. First, there isn't a BASIC program in the PET, so the bytes 1024 - 1026 indicate the end of a BASIC program. These are zeroes, as a zero linkage value is used for "end of program."

The 36 in location 1027 might be different on your PET. I haven't checked it out, but I suspect it is "memory trash." As an advanced exercise, enter a line or two of BASIC, do a CLR, XX = 0, and see what's after the ending 000 marker.

Locations 1028 and 1029 hold a pair of 88's - and CHR$(88) is "X." Since this is a floating point variable, the variable's name is easy to see.

If you home the cursor, and change the assignments to XX, the storage scheme for PET floating point numbers can be figured out. First, byte 1030 holds the binary exponent with the value .5 giving 128, 1 giving 129, and so on. Here are some examples:

| | Byte | | | | |
|---|---|---|---|---|---|
| XX = | 1030 | 1031 | 1032 | 1033 | 1034 |
| 1 | 129 | 0 | 0 | 0 | 0 |
| 2 | 130 | 0 | 0 | 0 | 0 |
| 4 | 131 | 0 | 0 | 0 | 0 |
| 65536 | 145 | 0 | 0 | 0 | 0 |
| .25 | 127 | 0 | 0 | 0 | 0 |

The number stored in bytes 1031-1034 is multiplied by 2 raised to the power of the number in byte 1030 (less 128).

The sign of the number is stored as the most significant bit in the first mantissa byte (in this case, byte 1031). Some examples:

| | Byte | | | | |
|---|---|---|---|---|---|
| XX = | 1030 | 1031 | 1032 | 1033 | 1034 |
| -1 | 129 | 128 | 0 | 0 | 0 |
| -1024 | 139 | 128 | 0 | 0 | 0 |
| 1024 | 139 | 0 | 0 | 0 | 0 |

OK, we know about the magnitude and the sign of our variable, XX. Figuring out the mantissa is more complicated. The key is in an idea called "normalization." For example, suppose you had the fraction (in binary) of .00110011 and we shift everything left by 3 places. The result would be 1.10011 multiplied by 2-3. Now, if every number were changed in this way, to always look like 1.******** multiplied by 2!!!!, there are two things to notice. First, this is just like our binary floating point - just add or subtract to the exponent byte. Second, there is always the 1. in every number, so why not write the number crunchers to assume this part is here and not store it in the memory. Another gain is that every number is now set up to its maximum precision and multiplications and divisions won't wreck the accuracy of a computation.

Here are some examples to sort out this mess, let's look at the value 32767:

| | Byte | | | | |
|---|---|---|---|---|---|
| XX = | 1030 | 1031 | 1032 | 1033 | 1034 |
| 32767 | 143 | 127 | 254 | 0 | 0 |

If this is expanded into binary digits, we see:

143 127 254 0
01001111 01111111 11111110 00000000

The leading zero in byte 1031 (127) is the sign of 32767, which is positive. The underlined 1's hold the value of 32767 x 2-14. Remember that this is really 1.11111111111111 with the 1. part missing.

I will leave it to you to decipher more complicated numbers (e.g., 123.456). It's too much for me! Some fun can be had by POKEing at our number, which will make new numbers. First, try making the largest possible number a PET can hold:

```
POKE 1030,255
POKE 1031,127
FORJ = 1032 TO 1034: POKEJ,
 255: NEXT
```

and now:

```
1.70141183E + 38
```

The smallest? Easy. POKE 1030,1

```
PRINT XX
```

(Do it yourself and see. Also try POKE 1030,255: POKE 1031,255.) Actually, the smallest in magnitude number requires that the mantissa be .....0000001. I am sure you can work this one out too.

Integer variables are simpler - they are just 16 bit values in 2's complement. I don't feel it's necessary to explain 2's complement in this column as the subject is covered in many computer texts. If you try XX% = 0 and do the FOR-NEXT loop again, note that the variable name XX is now seen as 216 (216 = 128 + 88). Only locations 1030 and 1031 will change as you fiddle with XX%'s value. (Challenge: There is one value for XX% that can be POKEd into place, but you can't set up with XX% = (value). What is it?)

Another thing, did you notice that location 1035 is 74 and that CHR$(74) happens to be J, and why is that?

Getting at strings is a little different. Byte 3 holds the size of the string, and the next two bytes point to where the string starts in the PET memory. Away we go:

```
CLR
XX$ = "EUREKA! I FOUND IT, I
THINK!"
FORJ = 1030 TO 1032: PRINT
PEEK(J) : NEXT
28
228
31          (If you have expansion
 memory, these two numbers will
                        differ.)
```

Byte 1030 holds 28, the number of letters and spaces in the string XX$. The next two values indicate where in memory the string starts.

```
PRINT 31*256 + 228
8164
```

The second of the two bytes is the most significant and must be multiplied by 256. Now we can extract the string from the PET.

```
FORJ = 8164 TO 8164 + 28-1:
PRINT CHR$(PEEK(J)); : NEXT
EUREKA! I FOUND IT, I THINK!
```

When the PET sees a string in the BASIC program text, like 10X$ = "THIS IS A CRUMMY EXAMPLE", there is no need to copy the string to another place in memory since the string's pointer can point to any place in memory. So, why not into the program text? This habit is also true of strings stashed in DATA statements. This means your PET tries to save on string space by avoiding unnecessary string copying.

Here are some things to try with the string variables and POKEs:

1. POKE a string into 255 characters, length, and make the pointer look into the PET's ROM (which is a sneaky way to PEEK into the ROM of your PET).

2. POKE a string into the screen memory. The start of the screen will be the pointer 0,128. A set of four properly POKEd strings would hold the entire screen, and think of the fun - as the screen changes, these string's contents would also change automatically, without any PEEKs or POKEs. This is a way to make a nifty "auto-input" routine by designating a part of the screen as an "input window."

*Continued on page 46*

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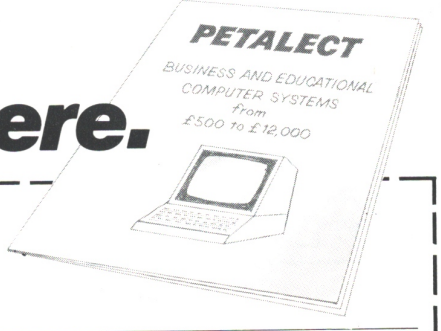


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# PET, cont'd...

## On To Array Variables

The storage of arrays is more complex than simple variables, as Figure 3 indicates. The first two bytes are the variable's name in the same format that simple variables use. The next two bytes indicate the total

| | |
|---|---|
| Byte 1 | Name & Type (Same as with Simple Variables) |
| Byte 2 | |
| Byte 3 | Total # of Bytes used by Array (Lo, High) |
| Byte 4 | |
| Byte 5 | Number of Dimensions n |
| Byte 6 | Size of Rightmost Dimension (High, Lo) |
| Byte 7 | |
| ..... | ..... |
| ..... | ..... |
| Byte 2n + 4 | Size of Leftmost Dimension (High, Lo) |
| Byte 2n + 5 | |
| Byte 2n + 6 | Start of Data Storage |
| | 2 Bytes for each Integer<br>3 Bytes for each String<br>5 Bytes for each Floating Point |

Figure 3

storage used by the array - that is, the space used by the variable name, array dimensions and values or pointers for each array element.

EXAMPLE OF AN ARRAY'S ORDER OF STORAGE

ARRAY CREATED BY DIM X(2,3,4)

```
X(0,0,0)     begin
X(1,0,0)
X(2,0,0)

X(0,1,0)
X(1,1,0)
X(½,1,0)

X(0,2,0)
X(1,2,0)
X(2,2,0)

X(0,3,0)
X(1,3,0)
X(2,3,0)

X(0,0,1)
X(1,0,1)
X(2,0,1)

etc

X(0,3,4)
X(1,3,4)
X(2,3,4)     end
```

Figure 4

Remember that the arrays will start after the simple variables.

## Where It Is All At - PET BASIC Pointers

When the PET runs a program, it does not search through the simple variables to find an array, or look through the BASIC program to find where the variables start. Deep in lower memory are some pointers which tell where each area begins and ends. Figure 5 shows these pointers for the old and new versions of the PET.

THE BASIC POINTERS FOR A PET

| OLD PET | | NEW PET | | WHAT IT IS |
|---|---|---|---|---|
| Low | High | Low | High | |
| 122 | 123 | 40 | 41 | Start of BASIC text. |
| 124 | 125 | 42 | 43 | Start of Simple Variables. |
| 126 | 127 | 44 | 45 | Start of Arrays |
| 128 | 129 | 46 | 47 | Start of Free Space |
| 130 | 131 | 48 | 49 | Bottom of Strings |
| 132 | 133 | 50 | 51 | Top of Strings |
| 134 | 135 | 52 | 53 | Top of BASIC memory |
| 146 | 147 | 64 | 65 | DATA statement pointer |

The value in a pointer can be obtained by multiplying the high value by 256 and adding to the low value. For example, the Bottom of String value is:
PEEK(130) + 256*PEEK(131)

Figure 5

Following the size are entries for the number of dimensions and the size of each dimension. After all this preamble, the values themselves are stored. Each value is the same format as simple variables; that is, a 5 byte floating point value for floating point, two byte integers, or string sizes and pointers.

Figure 4 indicates the order of elements for an example array to assist you if you want to explore arrays with PEEK and POKE. I leave this to you to do, it is too tedious to show in this column. Remember that arrays are moved each time a simple variable is allocated, so allocate your simple variables first i.e., J=0:DIM X(20).

Once the PET is started up (or reset), the values of these pointers are only changed as necessary. This means that the pointers to the top and bottom of memory can be changed by POKEs, and the PET will think that its memory is different. For example, if the start of BASIC were moved up to 2048 (and all the other pointers that start at the bottom of memory), the "safe area" for machine language is now extended by 1024 bytes. Here is some fiddling with the pointers as an example (remember that I have an old 8K PET):

```
(reset your PET)
?PEEK(134),PEEK(135)
0     32
```

The "top of memory" is at 8192 or one byte beyond the real top of memory which is 8191. All the pointers can be regarded as pointing to the start of their area. For the top of memory, this start is just beyond the end of memory "top of memory" = start of "beyond all memory," right?

```
?FRE(0)
7164
```

We have an 8K PET less a few bytes needed to evaluate the FRE function.

```
POKE 135,28
?FRE(0)
6140
```

The "top of memory" pointer has been moved down by 1024 bytes and now you have a "7K" PET, with a hole in the top, into which machine language or whatever can be put. As long as you don't reset your PET the top 1K won't be disturbed by BASIC (except by POKE).

Several BASIC commands really work by changing the BASIC pointer values. Here is a summary

| | |
|---|---|
| CLR | Sets DATA pointer to start of text -1 (That's why the 0 at 1024.<br>Top and Bottom of Strings become set to Top of Memory. Start of Arrays set to Start of Simple Variables.<br>Start of Free Space set to Start of Simple Variables. |
| RUN | Performs same as CLR and then starts program. |
| NEW | Start of Simple Variables set to Start of Text + 3, Then perform CLR. |
| LOAD | If executed in a program, load the new program from tape into the text area. If the new program extends beyond the Start of Variables, perform a CLR when finished with the load. |
| Editing | Do the editing, change Start of Variables. Do a CLR. |

Well, there's the anatomy of PET BASIC. If you combine this knowledge with screen gymnastics, a variety of things can be done. I will indicate some things to try:

1. Reset the PET, LOAD a program. POKE the Start of Text pointer to the byte before the end link value. (That's the first zero in the 000 at a program's end.) Now LOAD another program. POKE all the Start of Text pointers back to their original values. LIST your program, and APPEND has been done. (Warning - I haven't done this one, so it might not work.)

2. RUN a program. STOP it, look at all the variable pointers. Do some editing that does not make the program text longer. Change the pointers back to their original values. See if the program's variables are now "restored."

3. Here is a handy function. Why?

```
DEF FNF (X)=PEEK(X)+256*
(PEEK(X+1))
```

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